REPORT

OF THE

Health Department

OF

The Panama Canal

FOR THE

CALENDAR YEAR

1928

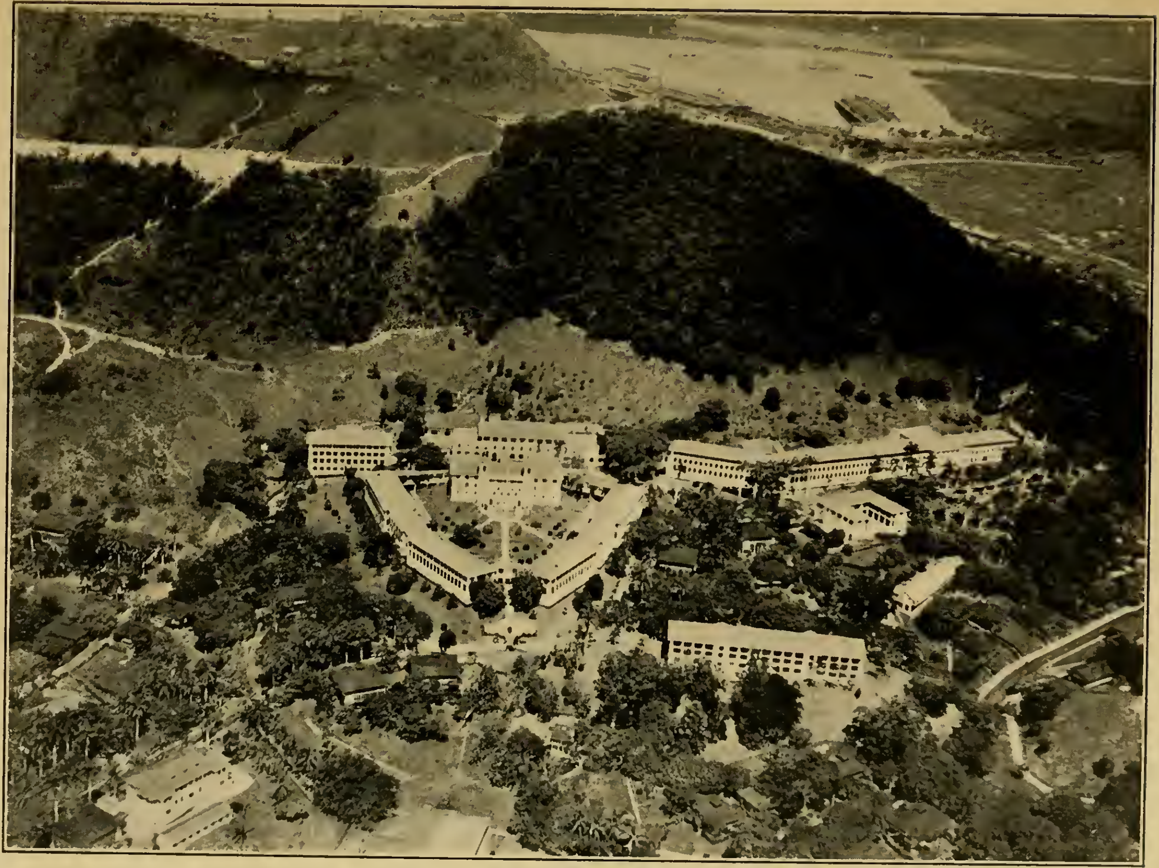
Gift of the Panama Canal Museum

W. P. CHAMBERLAIN
Colonel, Medical Corps, United States Army,
Chief Health Officer

Dr. D. P. CURRY
Assistant Chief Health Officer

BALBOA HEIGHTS, CANAL ZONE

THE PANAMA CANAL PRESS
MOUNT HOPE, C. Z.
1930



Cut No. 1.—Gorgas Hospital, with Ancon Hill and Balboa Harbor in background, as photographed from the air.

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For additional copies of this publication address The Panama Canal, Washington, D. C., or Balboa Heights, Canal Zone.

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LETTER OF TRANSMITTAL.

The Panama Canal, Health Department,
Balboa Heights, C. Z., *June 15, 1929.*

Col. Harry Burgess, U. S. Army,
Governor, The Panama Canal,
Balboa Heights, Canal Zone.

Sir: I have the honor to submit the following report of the Health Department for the calendar year 1928.

As this is the last of five reports submitted by me as Chief Health Officer, it seems appropriate to summarize for your information the progress of the Health Department during the period it has been under my immediate direction, from June 22, 1924, to June 15, 1929.

The aim has been to improve health conditions and hospital service, to reduce as far as practicable the current operating expenses, to increase earnings, and to employ all available funds for urgently needed constructive improvements in the Health Department plant. Previous activities of the Health Department have been kept up to former standards or else expanded, and all buildings and articles of equipment have been maintained by current repairs in the best of condition.

The progressive upward trend in the earnings of the Health Department during the last six fiscal years has been quite notable, as shown below:

Earnings, fiscal year 1923	$687,836.77
Earnings, fiscal year 1924	688,669.47
Earnings, fiscal year 1925	708,399.54
Earnings, fiscal year 1926	723,425.74
Earnings, fiscal year 1927	812,525.10
Earnings, fiscal year 1928	901,014.51
Earnings, fiscal year 1929 (Estimate based on nine months operation)	974,378.00

Marked growth of Health Department business has necessitated a considerable increase in personnel. Salaries and wages have been raised in order to keep step with compensation in other departments of The Panama Canal. These two classes of expenditure have consumed a material portion of the augmented earnings during the past three years.

As elsewhere in the world, hospital treatment has gained in popularity, with resulting additions to the work carried out by our institutions. The patient population of Gorgas Hospital averaged 355 daily for 1924, 429 for 1927, and 505 for 1928. Corozal Hospital insane population has increased from an average of 379 daily in 1924 to 548 in 1928. Palo Seco Leper Colony inmates averaged 89 in 1924 and 104 in 1928. At Colon Hospital the patients averaged 43 daily in 1924, 58 in 1928, and 73 during the first 5 months of 1929.

No epidemics have occurred in the Canal Zone or Cities of Panama and Colon except a very mild one of influenza in 1928.

The death rate for the Canal Zone for the period of 1924-1928 inclusive, has not varied appreciably from that for the preceding 6 years (1918-1923 inclusive), in spite of the gradual increases in the age of employees, both white and black. Death rates for Panama City and Colon during this same period are believed to have decreased although our statistical tables, based on the census of 1920, show an upward trend; obviously the population of both cities has materially increased, but there are no recent figures on which to estimate accurately the true mortality rate. (See discussion on pages 22 and 23 of this report.)

Infant mortality has declined appreciably during the past 5 years in Panama City and Colon; in the Canal Zone there has been an upward trend in the last 2 years, no cause for which is apparent other than the normal fluctuations to be expected when dealing with small numbers of cases. By lustrums the infant mortality rate has been as follows:

	Panama City.	*Colon.*	*Canal Zone.*
1914–1918, inclusive	230	217	169
1919–1923, inclusive	154	138	94
1924–1928, inclusive	133	115	98

The malaria admission rate among employees of The Panama Canal has declined. The average admission rate per 1,000 for the last three years (1926, 1927 and 1928) was 13; the average for the preceding ten years was 19. There has been a marked enlargement of the areas sanitated against malaria, as shown by Maps 2 and 3 in the body of this report. Furthermore, antimalarial sanitation has been greatly improved by the extensive substitution of permanent drainage for earth ditches and oiling, with the result that future maintenance charges in these areas will be greatly reduced while the chances of complete prevention of breeding will be materially enhanced. The following antimalarial drainage work has been carried out between July 1, 1924 and April 30, 1929, the total cost being $145,549:

394,102 feet of earth ditch costing $24,480 or about $0.06 per foot.
172,766 feet of 6-inch rock-covered tile costing $59,849 or about $0.35 per foot.
6,873 feet of 8-inch rock-covered tile costing $3,161 or about $0.46 per foot.
44,030 feet of precast concrete-bottomed ditch costing $33,821 or about $0.77 per foot.
11,368 feet of "double-decker" costing $10,233, or about $0.90 per foot.
150 feet of 20-inch concrete culvert costing $946.
162 feet of truncated V-shaped concrete ditch 4½ feet deep, costing $630.
250 feet of creosoted wood flume 4′ x 3′, costing $628.
196,301 feet of old earth ditch in coastal swamps on the Atlantic side have been greatly enlarged, amounting to practical reconstruction, at a cost of $11,801, or about $0.055 per foot.

The results of routine mosquito catches, as well as common personal experience, indicate that the number of mosquitoes on the wing in our sanitated towns has progressively decreased during the last 5 years. This is true as regards both disease-bearing and nondisease-bearing species.

The sums spent on antimosquito work by the Health Department since 1919 have been approximately as shown below; the marked recent rises over the expenditures for 1922-1924 are the result of the extensions and permanent improvements in the sanitated areas already referred to:

1919	$140,000	1924	$60,000
1920	140,000	1925	70,000
1921	105,000	1926	108,000
1922	80,000	1927	111,000
1923	80,000	1928	116,000

For use by the Division of Sanitation a new tile plant has been constructed in Ancon at a cost of over $3,000, including equipment. This building is provided with a gasoline concrete mixer and a new type of mold, designed by Dr. D. P. Curry, for manufacturing precast concrete sections; the improved equipment has resulted in the production of much better sections at a reduction of 20% in cost; also the rate of production has been accelerated and the new sections can be installed far more readily than the old. The better facilities of the new plant have increased the output of 6-inch concrete tiles, in 1-foot lengths, from about 300 to about 400 daily, using the same number of workmen as formerly. For our shore-line antimosquito work, two motor launches, replacing rowboats, have been built; also two rowboats and two scows; the total cost was over $1,700.

The Assistant Chief Health Officer, Dr. D. P. Curry, has developed himself into a competent medical entomologist, particularly along the lines necessary for our work; he has found and identified a number of species of mosquitos not previously known to exist on the Isthmus, and he has stimulated a commendable interest in this subject among the sanitary inspectors concerned in mosquito control, thereby broadening their grasp of the subject. To assist these observations, microscopes and other equipment have been purchased at a cost of about $850.

A district nurse for the Pacific side was employed on July 1, 1925, and she continued at this work exclusively until December 31, 1928, when it became necessary to suspend, temporarily, a part of this service. She has been of use in promoting school hygiene, assisting health centers and making pre- and post-natal visits.

Material improvement has been made in the sanitation of Panama City and Colon, particularly in the direction of more adequate food supervision, better disposal of garbage at lower cost, increased ventilation in tenement houses, and steady extension of rat-proofing.

In Panama City, due to the persistent efforts of the Heath Department, 2 modern pasteurizing plants for milk and 3 first-class plants for manufacturing ice cream have been completed, or are near completion, at a cost of approximately $83,000 to the owners. No plants that were in any way satisfactory for these purposes existed before in Panama City. Considerable progress has been made in the pasteurizing of milk in Colon. Under stimulus and assistance from the Health Department the dairy business in the Republic of Panama on both sides of the Isthmus has been expanded and greatly improved. Tuberculosis among the dairy herds about Panama City, which formerly was a serious menace, has been almost completely eradicated in the last four years, as shown by the following tuberculin test records:

Calendar year.	Type of test.	Number of animals tested.	Number of herds tested.	Number of reactors found.	Number of herds infected.	Per cent of reactors in total tested.
1926	Intradermal	1,743	31	199	19	11.4
1927	Intradermal	1,848	32	60	11	3.2
1928	Intradermal	2,197	29	5	3	0.2
1929	Intradermal	2,058	26	[1]11	4	0.5

[1] NOTE.—Of these 11 reactors, 2 were cattle brought from the United States since last year's test, and 7 were cattle not tested last year. This leaves only 2 cases which developed among the herds as they existed in 1928.

In Panama City, garbage disposal by the burial system has been improved by the substitution of fuel oil instead of "larvicide" as a fly-breeding preventative; the expense is less and the prevention is more complete. The Health Department garbage incinerator on the Atlantic side formerly serving Colon and Cristobal, was closed in

February, 1927, and the burial system was adopted; this change has proven entirely satisfactory and the average saving has been over $10,000 annually.

Under stimulus of the Health Department there has been great advance in swimming-pool sanitation, especially at Balboa, Pedro Miguel, and the Washington Hotel. In this work the Bureau of Clubs and Playgrounds and the Supply Department have cooperated by making large expenditures on our recommendation. The Health Department regularly tests the contents of these pools, which continuously conform to the highest standards for potable water.

At Gorgas Hospital the former high standard of service has been maintained and has continued to attract numbers of foreigners who desire to avail themselves of the opportunities offered. New departments have been established and old ones greatly expanded. Aside from current upkeep, the following major alterations, extensions and expansions have been accomplished:

(*a*) In the basements of sections C and D a total of 64 new windows have been cut, or existing ones enlarged, thereby admitting sufficient light and air to render these spaces suitable for storage, files, and if necessary, for emergency wards; approximate cost $1,640.

(*b*) The medical clinic was moved to the space in the administration building formerly used for general files, and 9 new offices and consulting rooms were installed therein at a cost of about $4,000. The steel file cases formerly occupying this space were set up on concrete slabs in the basement of section C, referred to in subhead (*a*) above.

(*c*) The eye, ear, nose, and throat department has been enlarged and improved at an expense of over $3,000. The 4 rooms formerly used by the medical clinic were added to this clinic.

(*d*) The main kitchen has been extensively altered to improve the lighting and ventilation at a cost of over $2,000. A new set of heavy-duty electric ranges was installed, costing $1,900.

(*e*) Ward 4 of section A has been altered so as to provide 11 much needed new private rooms, each with its own bath and porch; the cost of this work was about $30,000, not including furnishings. Extensive alterations in the central portion of the second floor of section A, necessary for coordination with these new rooms, were carried out by our hospital labor.

(*f*) The hospital garage and its approaches have been extensively improved at a cost of about $1,500.

(*g*) The entire water-heating system has been changed with resulting economy in fuel and elimination of nuisance from escaping steam. This was done with our own labor from time to time.

(*h*) Many wooden floors in corridors and bedrooms of the nurses' quarters have been replaced, partly by tile and partly by "colormix" cement, at a cost of about $1,500.

(*i*) In section B the entire signal-bell system has been replaced at a cost of about $2,600.

(*j*) In the isolation section an electric elevator-control has been installed at a cost of $1,535.

(*k*) Many new and expensive pieces of equipment have been purchased, of which the more important, with their costs, are:

Operating table	$705.00	Anesthesia apparatus, 3 sets	$692.00
Electrocardiograph	1,785.00	Dental apparatus, including X-ray outfit	3,656.00
File cases	3,783.00		
Room furniture	2,000.00	Eye apparatus	440.00
X-ray apparatus	1,300.00	Laboratory equipment	670.00
Planer	816.00	Autoclave	418.75
Adding machine	603.50	Vegetable peeler	548.41
Metabolism apparatus	200.00	Obstetrical bed	322.10
Air compressor	120.00	Typewriters	745.66
Brine pump	236.00	Vegetable cooker	349.97
Suction apparatus	175.75	Electroscope	137.00
Fulguration apparatus	207.00	Therapeutic bath	331.20
Steam table	250.00	Water sterilizer, electric	365.00
Electric localizer	162.50	Bread slicing machine	170.00
Instrument cabinets	344.00		
		Total	21,533.84

(*l*) Two new professional services have been created, a physiotherapy department and a dental department. These have materially improved our facilities for diagnosis and treatment.

(*m*) Funds have been obtained from Congress, and plans are completed for a much needed addition to the nurses' quarters which will contain 28 new bedrooms, each with a private bath and porch, and 5 public rooms of various sizes. The estimated cost with equipment is $90,000. It is hoped that work will start September 1, 1929.

(*n*) From funds found to be available near the end of the fiscal year 1929, requisitions were made early in June covering $15,000 worth of new equipment for the hospital, of which the most important items are: One refrigerating machine, $5,000; 1 slit lamp and corneal microscope, $700; 1 Gulstrand ophthalmoscope, $400; 2 monel metal dishwashing machines, $1,129; 1 Buckeye operating table, $500; 2 giantscopes, $250; 24 adjustable beds, $830; Zeiss binocular microscope, $400; saccharimeter, $420; cases of trial lenses, $400; Graham truck, $1,330; mahogany dressers for nurses, $750; 4 electric refrigerators, $998.

At Colon Hospital there have been installed a gas range (replacing coal) at a cost of $443, a refrigerating plant (replacing an ice box) at a cost of about $2,000, and an oil-burning plant for heating water (no previous hot water supply) at a cost of about $600. Construction of a basement under the storehouse, and a rearrangement of storerooms in the kitchen wing, resulted in an increase of 20 in the bed capacity of the institution; this work was carried out by our own labor at a cost for materials of only $221. Two isolation rooms were provided, each with its own bath and toilet facilities, replacing the unsuitable isolation section formerly used in the old quarantine barrack. Extensive replacement of deteriorating concrete has been effected by our own labor. Considerable general equipment has been purchased, of which the most important items are an operating table costing $705, an anesthesia apparatus costing $228, an X-ray apparatus costing $1,142, and steel file cabinets costing $885.60.

Notable changes have been made at Corozal Hospital, where 6 dilapidated frame buildings have been replaced by 4 permanent new ones. The 3-story concrete building, containing wards for 120 patients on the two upper floors and occupational shops and surgical dressing rooms in the basement, was erected at a cost of $157,313; it was occupied November 19, 1927. The concrete kitchen-mess-hall building, with refrigerating rooms, general shops and storerooms, was occupied March 20, 1928; the structure itself cost $110,100, and it was equipped with a refrigerating machine, electric ranges, steam cookers, vegetable peelers, tables, etc., at a total cost of $9,858, plus the expense of installing with our own labor. The new concrete and frame laundry, occupied February 21, 1928, was erected at a cost of $5,648; about $650 worth of equipment was placed in it. The new concrete and frame boiler house was constructed by our own labor, which also installed a four-inch oil line 1,400 feet long, and four 65-barrel oil tanks, all connected with the main oil supply line of The Panama Canal; the material for this work cost $1,361, exclusive of tanks which had been on hand for many years. The use of oil instead of coal has proved a marked economy as well as a great convenience.

The dairy building at Corozal Hospital has been completely rebuilt inside, new and larger refrigerating rooms being constructed; the floor of the milk room, and the walls to a height of 6 feet, were tiled. The approximate cost of these improvements was $4,800, exclusive of our own labor which did much of the work. New machinery, including a 50-gallon pasteurizer, Tycos recording thermometer, milk cooler, bottle filler and capper, mechanical bottle washer, 15 horsepower oil-operated steam boiler, 4-ton refrigerating machine, and brine tank, has been installed at a cost of about $4,400. The cow stables have been extensively improved by repairing roof, replacing wooden gates by iron, and installing 100 individual feed mangers. A calf shed 20 x 50 feet has been built at a cost of about $500. The piggery has been reroofed.

Forty-three cows from Costa Rica, 7 cows from Panama, 20 Jersey cows from the United States, and 5 bulls from Mindi Dairy have been purchased for Corozal Dairy at a cost of about $12,600. Milk production which in 1924 was approximately 60 quarts per day has recently been averaging above 500 quarts.

Additional work done at Corozal Hospital includes a concrete unloading platform back of the new kitchen, 951 feet of 12-foot concrete road and 3,273 feet of 4-foot concrete sidewalk, together costing about $7,000; also grading of grounds, costing $3,500 and new street lights, costing $637.

At Palo Seco Leper Colony two new permanent structures have been erected, each with concrete lower story and frame upper story. One building contains two 6-bed wards, operating room, drugroom, offices, commissary and storeroom; the other provides for the general kitchen, refrigerating rooms, mess hall for 120 patients, mess hall for 30 attendants, laundry, storerooms, and a 75,000 gallon cistern for rain water to be used in laundering. Oil tanks and oil burners for the kitchen ranges and the laundry boiler have been substituted for coal-burning equipment. A refrigerating machine has been installed which cools the cold-storage rooms and makes enough ice for the institution; formerly all cooling was dependent on ice brought by boat. The total cost of these improvements is approximately $31,000. Funds have been set aside for the conversion of the old kitchen-mess-hall building into a patients' recreation room; this work will be started shortly and will cost about $4,200. A new engine has been placed in the Leper Colony launch at a cost, including installation, of $1,200.

Mount Hope Cemetery has been materially enlarged and many improvements have been made in the buildings, fences, roads, and grading. At Mount Hope Cemetery and at Corozal Cemetery concrete stands for memorial services have been erected at a cost of $6,800 for the two.

At Pedro Miguel Dispensary a concrete garage for the ambulance was constructed at a cost of $600. Balboa Dispensary was altered on the second floor so as to provide a set of family quarters for a physician; the cost was $2,100, one-half of which was paid by the Health Department and the remainder by the Supply Department.

A complete new equipment of Dodge and Graham Brothers motor transportation for the Health Department was purchased during 1925 and 1926, replacing worn-out vehicles, mostly ancient Fords. Four of the bodies were built in our own shops to provide for our special climatic conditions. The equipment, costing over $20,000, consists of 9 ambulances, 1 hearse, and 3 trucks. An additional truck costing about $1,300 is now under order.

The publication of the *Proceedings of the Medical Association of the Isthmian Canal Zone*, a volume which has always been highly regarded in medical circles, was discontinued for reasons of economy in 1921. Publication was resumed in 1927, the years 1921 to 1926, inclusive, being included in one volume; the cost of this was $1,160.20. A memorial publication entitled *Twenty-five Years of American Medical Activity on the Isthmus of Panama*, was published at a cost of about $600, being released early in June, 1929.

In all the work carried out by the Health Department it has been a great pleasure to receive sympathetic assistance from the Governor's office and hearty cooperation from the various departments and divisions of The Panama Canal. Praise is due all the employees of the Health Department for the loyal support they have given to the policies put in operation.

Respectfully,

W. P. CHAMBERLAIN,
Chief Health Officer.

HEALTH DEPARTMENT.

OPERATION AND ORGANIZATION.

There were no changes in the operation and organization of the Health Department.

PERSONNEL.

There has been no change in the higher supervisory personnel. On December 31, 1928, there were 266 white and 828 colored employees—a total of 1,094. The white force was divided as follows:

32 physicians, medical officers of the United States Army.
1 dentist, dental officer of the United States Army.
1 physician, surgeon, United States Public Health Service.
30 physicians, civilian.
9 internes.
6 male nurses.
107 female nurses.
27 clerks.
12 sanitary inspectors.
2 quarantine inspectors.
6 veterinarians.
7 technicians.
10 dispensary assistants.
3 pharmacists.
13 miscellaneous—storekeeper, chemists, stewardesses, carpenter, foremen, mechanics, embalmer, vaccinator, plumber.

The individuals filling the higher positions on December 31, 1928, and their respective duties, were as follows:

CHIEF HEALTH OFFICE.

Balboa Heights.

Col. Weston P. Chamberlain, Medical Corps, U. S. Army, Chief Health Officer.
Dr. Dalferes P. Curry, Assistant Chief Health Officer.
Surgeon Marion F. Haralson, U. S. P. H. S., Chief Quarantine Officer.
Mr. Arthur L. Fessler, Office Assistant.

DIVISION OF HOSPITALS AND CHARITIES.

Gorgas Hospital.

Col. George M. Ekwurzel, Medical Corps, U. S. Army, Superintendent.
Maj. John W. Sherwood, Medical Corps, U. S. Army, Assistant to Superintendent.
Mr. E. F. Ohlson, Executive Assistant.
Dr. Troy W. Earhart, Chief of Surgical Service.

Gorgas Hospital—Continued.

Dr. Howard K. Tuttle, Assistant Chief of Surgical Service.
Maj. Henry C. Dooling, Medical Corps, U. S. Army, Chief of Medical Service.
Maj. Paul M. Crawford, Medical Corps, U. S. Army, Assistant Chief of Medical Service.
Dr. Ivan E. Hix, Chief of Eye, Ear, Nose, and Throat Service.
Capt. Ralph H. Simmons, Medical Corps, U. S. Army, Assistant Chief of Eye, Ear, Nose, and Throat Service.
Dr. Leroy S. Townsend, Chief of X-Ray Service.
Capt. Richmond Favour, Jr., Medical Corps, U. S. Army, Chief of Physio-Therapy Service.
Maj. Geo. C. H. Franklin, Medical Corps, U. S. Army.
Maj. Percy E. Duggins, Medical Corps, U. S. Army, Obstetrician
Maj. Burgh S. Burnet, Medical Corps, U. S. Army.
Maj. Curtis D. Pillsbury, Medical Corps, U. S. Army.
Maj. Laurent L. La Roche, Medical Corps, U. S. Army.
Maj. Ned O. Lewis, Medical Corps, U. S. Army.
Capt. James R. Hudnall, Medical Corps, U. S. Army.
Capt. Robert E. Thomas, Medical Corps, U. S. Army.
Capt. Frank P. Strome, Medical Corps, U. S. Army, Cardiologist
Capt. Frank W. Pinger, Medical Corps, U. S. Army.
Capt. Arthur B. McCormick, Dental Corps, U. S. Army.
Capt. William F. DeWitt, Medical Corps, U. S. Army.
Capt. Stanley W. Matthews, Medical Corps, U. S. Army.
Capt. William Kraus, Medical Corps, U. S. Army.
Capt. Loren D. Moore, Medical Corps, U. S. Army.
Capt. Alvin L. Gorby, Medical Corps, U. S. Army.

Internes.

Dr. Ralph E. Poston, senior interne.
Dr. Harry Brinkman
Dr. Carl C. Carrico
Dr. Merrill H. Judd
Dr. Maurice O. Klingler
Dr. Cecil S. Mollohan
Dr. Frank A. Raymond
Dr. William W. Thoms
Dr. Worling R. Young

Board of Health Laboratory.

Dr. Lewis B. Bates, Chief of Laboratory.
Capt. S. D. Avery, Medical Corps, U. S. Army, Bacteriologist.
Capt. Raymond O. Dart, Medical Corps, U. S. Army, Pathologist.
Mr. James E. Jacob, Chemist.

Corozal Hospital.

Capt. Cleve C. Odom, Medical Corps, U. S. Army, Superintendent.
Capt. Reeve Turner, Medical Corps, U. S. Army.
Capt. John P. Russell, Medical Corps, U. S. Army.
Dr. Lawrence G. Combs, Veterinarian and Dairy Manager.
Dr. William F. Gross, Veterinarian and Meat Inspector (Relief).

Colon Hospital.

Maj. John Wallace, Medical Corps, U. S. Army, Superintendent.
Dr. William V. Levy, Chief of Medical Service.
Dr. Wayne Gilder.
Capt. Aubrey K. Brown, Medical Corps, U. S. Army.
Capt. Brooke Dodson, Medical Corps, U. S. Army.
Capt. Leland E. Dashiel, Medical Corps, U. S. Army.
Capt. E. W. Billick, Medical Corps, U. S. Army.

Palo Seco Leper Colony.

Dr. Ezra Hurwitz, Superintendent.

Cristobal-Colon Dispensary.

Dr. William V. Levy, District Physician.

Gatun Dispensary.

Dr. James A. Grider, District Physician.

Pedro Miguel Dispensary.

Dr. David G. Sampson, District Physician.
Dr. John C. Wilkinson.
Dr. Chester J. Sturges (Relief).

Balboa Dispensary.

Dr. Littleton O. Keen, District Physician.
Dr. Walter C. Friday.
Dr. Julian R. Hunt.
Dr. William H. Presnell.

Ancon Dispensary.

Dr. Walter K. Olson, District Physician.
Dr. George Eugene.

DIVISION OF SANITATION.

Panama Health Office.

Dr. Henry Goldthwaite, Health Officer.
Mr. James M. Carpprow, Sanitary Inspector.
Mr. John P. Corrigan, Sanitary Inspector.
Mr. Morris M. Seeley, Sanitary Inspector.
Mr. George L. Willett, Sanitary Inspector.

Panama Health Office—Continued.

Mr. E. Frederick Quimby, Sanitary Inspector.
Dr. I. C. Mattatall, Supervising Veterinarian and Meat Inspector.
Dr. Troy S. Hopkins, Veterinarian and Meat Inspector.
Dr. H. A. Lewis, Vaccinator.

Cristobal-Colon Health Office.

Dr. Jesse L. Byrd, Health Officer.
Mr. Thomas A. Leathley, Sanitary Inspector.
Mr. James L. Tolar, Sanitary Inspector.
Mr. Charles H. Bath, Sanitary Inspector.
Dr. F. F. Dowd, Veterinarian and Meat Inspector.
Dr. Claire C. Clay, Veterinarian and Meat Inspector.

Canal Zone Sanitation.

Mr. Charles L. Pierce, Division Sanitary Inspector, Southern and Panama-Suburban Districts, Ancon.
  Mr. Raymond E. Forbes, Sanitary Inspector, Ancon.
  Mr. Carl G. Brown, Sanitary Inspector, Ancon.
Mr. Charles A. Roach, Sanitary Inspector, Northern District, Gatun.

DIVISION OF QUARANTINE.

Surgeon Marion F. Haralson, U. S. P. H. S., Chief Quarantine Officer (See Chief Health Office).

Cristobal-Colon Quarantine, Cristobal.

Dr. Charles A. Hearne, Quarantine Officer.
Dr. Francis L. Alexaitis.
Dr. Herbert L. Phillips.
Dr. Denver F. Gray.

Balboa-Panama Quarantine, Balboa.

Dr. John D. Odom, Quarantine Officer.
Dr. Philip Horwitz.
Dr. Samuel S. Irvin.
Dr. Boldridge E. Kneece.

FINANCIAL STATEMENT.

The funds for the operation of the Health Department are derived partly from specific appropriations made annually by Congress, and partly from the earnings of the Department, as shown by the following statement:

OPERATING EXPENSES AND EARNINGS OF SUBDIVISIONS OF THE HEALTH DEPARTMENT, CALENDAR YEAR 1928.

	Expenditures.	Earnings.	Per cent self supporting.	Gross cost per patient per day.
Gorgas Hospital	[1]$861,794.93	$469,951.14	54	$4.66
Colon Hospital	[2]137,335.99	61,002.64	44	6.43
Corozal Hospital for the insane	[3]226,688.06	172,549.87	76	1.00
Palo Seco Leper Colony	52,664.74	21,561.75	41	1.39
Maritime quarantine service	[4]78,598.06	29,859.07	38	
Sanitation of the cities of Panama and Colon	71,219.81	9,532.43	13	
Street cleaning and garbage collection and disposal, cities of Panama and Colon	128,607.76	105,096.80	[7]82	
Canal Zone sanitation	163,762.78	47,868.27	29	
Line dispensaries	57,955.91	19,497.41	34	
Medical storehouse	8,473.77			
Chief Health Office and miscellaneous	[5]34,594.92	550.00	2	
Totals	[6]1,821,696.73	937,469.38	51	

[1] Includes Army pay of Army medical officers, which amounted to $111,352.09
Also includes cost of operation of Board of Health Laboratory and Ancon Dispensary.

[2] Includes Army pay of Army medical officers, which amounted to 20,925.26
Also includes cost of operating Colon Dispensary.

[3] Includes Army pay of Army medical officers, which amounted to 12,237.00
Also includes care of cripples and chronics, and operation of farm and dairy.

[4] Includes Public Health Service pay of U. S. P. H. S. officers, which amounted to 6,590.55

[5] Includes Army pay of Army medical officer, which amounted to 6,355.85

[6] Includes Army and Public Health Service pay, which amounted to 157,460.75

[7] Earnings include the 75 per cent of total expense, plus 10 per cent overhead, which is billed to the Republic of Panama.

OPERATING EXPENSES OF THE HEALTH DEPARTMENT, CALENDAR YEAR 1928, SHOWING AMOUNT CHARGED TO THE VARIOUS ACCOUNTS.

Gold pay roll (white employees):		
Panama Canal pay	$580,414.71	
Army pay	150,870.20	
Public Health Service pay	6,590.55	
		$737,875.46
Silver pay roll (colored employees)		439,063.95
Subsistence supplies		225,032.06
Ice		6,400.86
Hospital supplies and drugs		85,138.53
Equipment		35,550.18
Miscellaneous material and supplies		81,653.07
Laundry		41,514.77
Telephones		14,831.15
Repatriation of patients physically or mentally disabled		3,286.95
Medical storehouse operation		8,473.77
Launch service		6,146.16
Electric current		13,688.13
Electric repairs and installations		11,266.96
Water		15,067.30

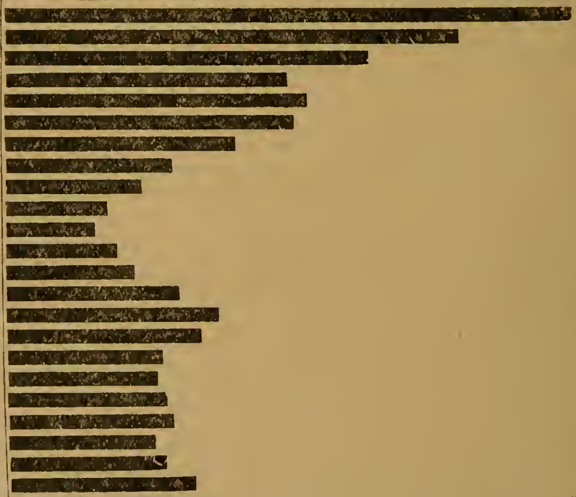
Motor transporation (except for hospitals, quarantine stations, and dispensaries)	$48,581.50
Repairs to motor transportation for hospitals, quarantine stations, and dispensaries	3,413.45
Rental of quarters	2,360.47
Freight on supplies	1,839.11
Building repairs and minor construction	24,365.57
Miscellaneous charges for services of other Panama Canal Departments	16,147.33
Total operating expenses	1,821,696.73
Salaries of Army medical officers, and United States PublicHealth Service officers, paid from appropriations for those services	157,460.75
Total operating expenses as charged against Health Department funds	1,664,235.98

SUMMARY OF VITAL STATISTICS[1] REGARDING EMPLOYEES ONLY.[2]

The five following charts are for the total employed force, which for the year 1928 averaged 3,308 whites and 10,952 negroes.

Chart No. 1.—Admission Rate To Hospitals and Quarters from All Causes, Employees Only.

Year.	Average number employed.	Rate per 1,000.
1906	26,547	1,779
1907	39,238	1,419
1908	43,890	1,132
1909	47,167	887
1910	50,802	905
1911	48,876	896
1912	50,893	727
1913	56,654	519
1914	44,329	420
1915	34,785	320
1916	33,176	283
1917	32,589	357
1918	25,520	406
1919	24,204	550
1920	20,673	672
1921	14,389	620
1922	10,447	490
1923	10,976	485
1924	11,625	513
1925	12,180	519
1926	12,732	474
1927	13,561	502
1928	14,260	595



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[1] All rates throughout this report are computed as annual per 1,000.

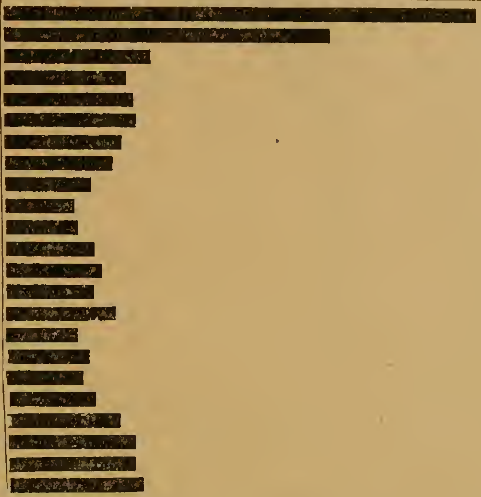
[2] Includes all employees of The Panama Canal and the Panama Railroad on the Isthmus; that is, in the Canal Zone and cities of Colon and Panama.

Active sanitary work in the Canal Zone and in the cities of Colon and Panama was undertaken by the United States soon after the control of the property of the French Canal Company was taken over in May, 1904. Tables are therefore carried as far back toward that date as figures are available, to give a comparison of the results of work done since.

The admission rate* to hospitals was 176.72 in 1928, as compared with 146.15 in 1927, and 140.98 in 1926. From disease alone the admission rate to hospitals in 1928 was 154.42, as compared with 122.19 in 1927, and 123.31 in 1926.

CHART NO. 2.—DEATH RATE FROM ALL CAUSES, EMPLOYEES ONLY.

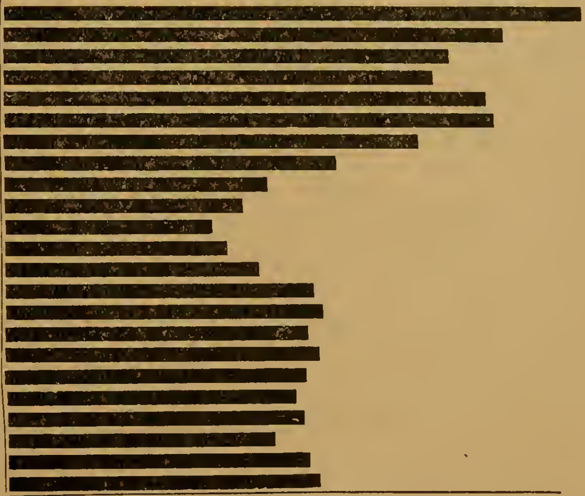
Year.	Average number employed.	Rate per 1,000.
1906	26,547	41.73
1907	39,238	28.74
1908	43,890	13.01
1909	47,167	10.64
1910	50,802	10.98
1911	48,876	11.02
1912	50,893	9.18
1913	56,654	8.35
1914	44,329	7.04
1915	34,785	5.77
1916	33,176	6.03
1917	32,589	7.09
1918	25,520	8.11
1919	24,204	7.23
1920	20,673	8.70
1921	14,389	6.46
1922	10,447	6.89
1923	10,976	6.65
1924	11,625	7.23
1925	12,180	8.95
1926	12,732	9.03
1927	13,561	9.00
1928	14,260	9.96



The death rate from disease alone for 1928 was 9.19, as compared with 7.82 in 1927, and 7.46 in 1926.

CHART NO. 3.—NONEFFECTIVE RATE FROM ALL CAUSES, EMPLOYEES ONLY.

Year.	Average number employed.	Rate per 1,000.
1906	26,547	28.48
1907	39,238	25.09
1908	43,890	22.31
1909	47,167	21.93
1910	50,802	24.37
1911	48,876	24.46
1912	50,893	21.11
1913	56,654	15.97
1914	44,329	12.22
1915	34,785	10.28
1916	33,176	9.20
1917	32,589	9.65
1918	25,520	11.19
1919	24,204	14.29
1920	20,673	14.87
1921	14,389	13.96
1922	10,447	14.81
1923	10,976	13.78
1924	11,625	13.51
1925	12,180	13.77
1926	12,732	12.08
1927	13,561	13.81
1928	14,260	14.66



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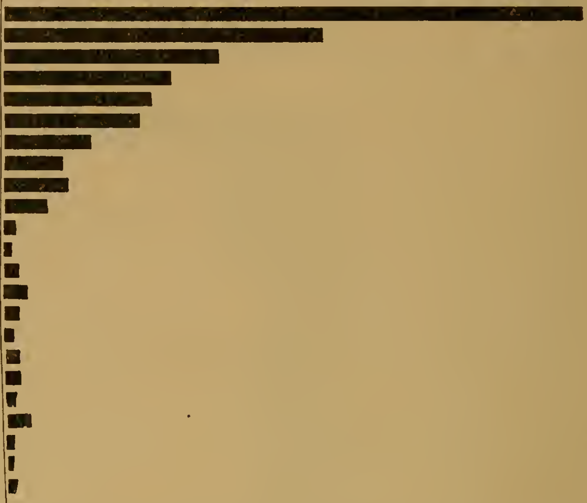
*Admission rate is based on discharges from and deaths in hospitals, as shown in Table I, page 64.

CHART NO. 4.—ADMISSION RATE FROM MALARIA, EMPLOYEES ONLY.

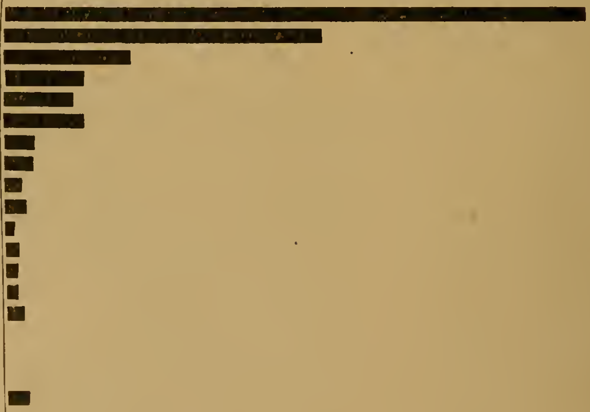
Year.	Average number employed.	Rate per 1,000.
1906	26,547	821
1907	39,238	424
1908	43,890	282
1909	47,167	215
1910	50,802	187
1911	48,876	184
1912	50,893	110
1913	56,654	76
1914	44,329	82
1915	34,785	51
1916	33,176	16
1917	32,589	14
1918	25,520	18
1919	24,204	31
1920	20,673	19
1921	14,389	15
1922	10,447	17
1923	10,976	19
1924	11,625	16
1925	12,180	[1] 27
1926	12,732	14
1927	13,561	11
1928	14,260	14



[1] Rate would be only 16 if cases from Bruja Point were omitted. See p. 16, Report of H. D. for calendar year 1925.

CHART NO. 5.—DEATH RATE FROM MALARIA, EMPLOYEES ONLY.

Year.	Average number employed.	Rate per 1,000.
1906	26,547	7.45
1907	39,238	3.51
1908	43,890	1.37
1909	47,167	.85
1910	50,802	.81
1911	48,876	.84
1912	50,893	.31
1913	56,654	.30
1914	44,329	.14
1915	34,785	.23
1916	33,176	.06
1917	32,589	.09
1918	25,520	.08
1919	24,204	.08
1920	20,673	.15
1921	14,389	.00
1922	10,447	.00
1923	10,976	.00
1924	11,625	.17
1925	12,180	.00
1926	12,732	.00
1927	13,561	.00
1928	14,260	.00



The 6 diseases causing the highest number of hospital admissions among employees, with their rates, were as follows:

	1927.		1928.	
	Admissions.	Rate per 1,000.	Admissions.	Rate per 1,000.
Malaria (includes the few cases treated in quarters)	145	10.69	203	14.24
Venereal diseases	139	10.25	189	13.25
Influenza	30	2.21	140	9.80
Diseases of pharynx and tonsils	127	9.37	121	8.35
Diseases of the eyes and their annexa	84	6.12	103	7.22
Bronchitis	41	3.02	57	4.00

The 6 diseases causing the highest number of deaths among employees, with their rates, were as follows:

	1927.		1928.	
	Deaths.	Rate per 1,000.	Deaths.	Rate per 1,000.
Pneumonia, lobar	4	.29	17	1.19
Syphilis	10	.74	15	1.05
Tuberculosis (various organs)	11	.81	12	.84
Apoplexy	6	.44	12	.84
Organic diseases of the heart	14	1.03	11	.77
Nephritis (chronic)	16	1.18	11	.77

The admission rate to hospitals from disease, and death rate from disease, for white employees, were 240.33 and 5.74 respectively, as compared with 128.47 and 10.23 for black employees.

The death rate from disease for American (white) employees was 4.13, as compared with 4.99 for 1927 and 6.23 for 1926.

SUMMARY OF VITAL STATISTICS FOR THE CANAL ZONE—EMPLOYEES AND NONEMPLOYEES.

From an average population of 37,056 in the Canal Zone, there were 316 deaths during the year; 273 of these were from disease, giving a rate of 7.37, as compared with 7.20 for 1927, and 6.72 for 1926.

The death rate from tuberculosis was 0.70, as compared with 0.49 for 1927, 0.65 for 1926, 0.89 for 1925, and 1.01 for 1924. Tuberculosis caused 10 per cent of all deaths from disease during the year, as compared with 7 per cent in 1927, 10 per cent in 1926, 13 per cent in 1925, and 13 per cent in 1924.

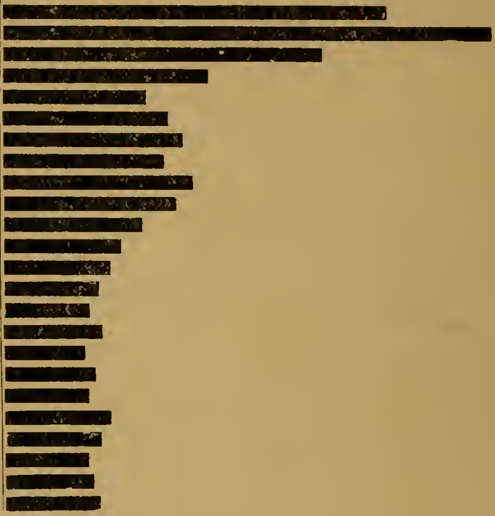
There were 513 live births reported during the year, giving a birth rate of 13.84. (See table VII, page 76.) Of these, 170 were white, and 343 were black Of the total births reported, 7 per cent were stillbirths.

Deaths among children under 1 year of age, from all causes, totaled 59, of which 16 were white and 43 black, giving an infant mortality rate based on the number of live births reported during the year, of 94.12 for white children, 125.65 for black children, and a general average of 115.01.

Of the total deaths for all ages, 19 per cent occurred among children under 1 year of age, and 26 per cent among children under 5 years of age.

CHART NO. 6.—DEATH RATE FROM ALL CAUSES, CANAL ZONE ONLY. EMPLOYEES AND NONEMPLOYEES.

Year.	Population.	Deaths.	Rate per 1,000.
1905	23,463	828	35.29
1906	34,095	1,700	49.86
1907	54,036	1,708	31.60
1908	67,146	1,273	18.95
1909	76,900	1,025	13.33
1910	86,465	1,251	14.47
1911	90,434	1,385	15.32
1912	79,279	1,129	14.24
1913	61,700	1,047	16.97
1914	46,379	710	15.31
1915	31,496	410	12.83
1916	31,447	343	10.91
1917	33,044	328	9.93
1918	33,803	286	8.49
1919	32,366	247	7.63
1920	27,459	242	8.81
1921	31,377	236	7.52
1922	31,098	254	8.17
1923	31,793	253	7.96
1924	33,723	305	9.05
1925	34,840	297	8.53
1926	36,480	284	7.79
1927	36,794	298	8.10
1928	37,056	316	8.53



SUMMARY OF VITAL STATISTICS FOR PANAMA CITY.

From an estimated population of 59,818, there were 1,434 deaths. Of these, 1,390 were from disease, giving a rate from disease of 23.23, as compared with 20.14 in 1927, and 19.32, in 1926. The recent population of Panama City, as used in Chart No. 7, is based on the census of 1920, slightly reduced in 1922 and 1923 as a result of the departure of persons who took leases on Canal Zone land which was thrown open to settlement in 1922. Reliable estimates indicate that the present population of Panama City is at least 70,000. On the basis of 70,000, the *total* death rate in 1928 would be 20.50 instead of 23.97 as shown in Chart No. 7.

The 6 diseases causing the highest number of deaths, with their rates, were as follows:

	1927.		1928.	
	Deaths.	Rate per 1,000.	Deaths.	Rate per 1,000.
Pneumonia, broncho and lobar	187	3.14	248	4.15
Tuberculosis (various organs)	180	3.02	227	3.79
Diarrhea and enteritis (including colitis)	122	2.05	117	1.96
Nephritis, acute and chronic	105	1.76	115	1.92
Organic diseases of the heart	112	1.88	105	1.76
Syphilis	46	.77	48	.80

The death rate from tuberculosis was 3.79, as compared with 3.02 for 1927, 3.39 for 1926, and 3.67 for 1925. Tuberculosis caused 16 per cent of all deaths from disease, as compared with 14 per cent in 1927, 18 per cent in 1926, 19 per cent in 1925, and 17 per cent in 1924.

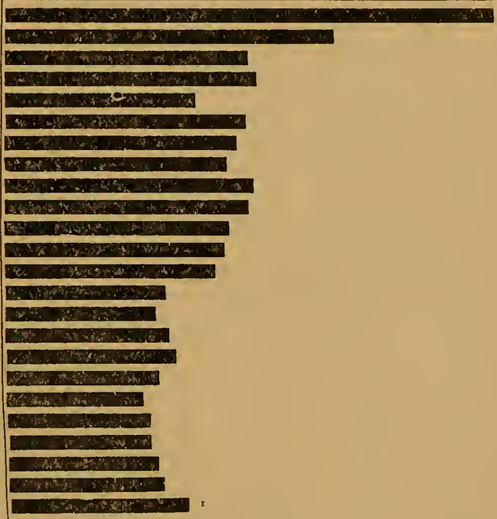
There were 2,458 live births reported during the year, giving a birth rate of 41.09. Of the total births reported, 5 per cent were stillbirths.

There were 364 deaths among children under 1 year of age, giving an infant mortality rate, based on the number of live births reported during the year, of 148.09.

Of the total deaths for all ages, 25 per cent occurred among children under 1 year of age, and 36 per cent among children under 5 years of age.

CHART NO. 7.—DEATH RATE FROM ALL CAUSES, CITY OF PANAMA.

Year.	Population.	Deaths.	Rate per 1,000.
1905	21,984	1,447	65.82
1906	25,518	1,142	44.75
1907	33,548	1,156	34.45
1908	37,073	1,292	34.83
1909	40,801	1,038	25.44
1910	45,591	1,446	31.72
1911	46,555	1,456	31.27
1912	47,057	1,380	29.33
1913	47,172	1,507	31.95
1914	53,948	1,863	34.53
1915	60,373	1,810	29.98
1916	60,778	1,765	29.04
1917	61,074	1,714	28.06
1918	61,369	1,314	21.41
1919	61,369	1,211	19.74
1920	60,500	1,297	21.44
1921	60,500	1,336	22.09
1922	60,068	1,279	21.29
1923	59,635	1,106	18.55
1924	59,635	1,168	19.59
1925	59,635	1,169	19.60
1926	59,635	1,188	19.92
1927	59,635	1,248	20.93
1928	59,818	1,434	23.97 [1]



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[1] See first paragraph under "Summary of Vital Statistics for Panama City, page 22."

SUMMARY OF VITAL STATISTICS FOR COLON.

From an estimated population of 32,000, there were 442 deaths during the year; of these, 426 were from disease, giving a rate of 13.31, as compared with 12.79 for 1927, and 13.65 for 1926. Latest estimates indicate that the population of Colon is at least 40,000. On that basis, the *total* death rate in 1928 would be 11.05 instead of 13.81 as shown in Chart No. 8.

The 6 diseases causing the highest number of deaths, with their rates, were as follows:

	1927.		1928.	
	Deaths.	Rate per 1,000.	Deaths.	Rate per 1,000.
Pneumonia, broncho and lobar	39	1.23	68	2.13
Tuberculosis, various organs	80	2.53	63	1.97
Diarrhea and enteritis	27	.85	27	.84
Cancer, various organs	26	.82	26	.81
Nephritis, acute and chronic	37	1.17	23	.72
Apoplexy	17	.54	19	.59

The death rate from tuberculosis was 1.97, as compared with 2.53 for 1927, 2.46 for 1926, 2.01 for 1925, and 2.62 for 1924. Tuberculosis caused approximately 15 per cent of all deaths from disease, as compared with 19 per cent in 1927, 18 per cent in 1926, 17 per cent in 1925, and 18 per cent in 1924.

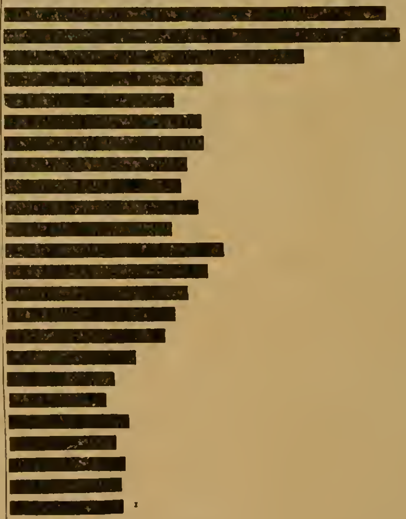
There were 760 live births reported during the year, giving a birth rate of 23.75. Of the total births reported, 5 per cent were stillbirths.

There were 79 deaths among children under 1 year of age, giving an infant mortality rate, based on the number of live births reported during the year, of 103.95.

Of the total deaths for all ages, 18 per cent occurred among children under 1 year of age, and 25 per cent among children under 5 years of age.

CHART NO. 8.—DEATH RATE FROM ALL CAUSES, CITY OF COLON.

Year.	Population.	Deaths.	Rate per 1,000.
1905	11,176	553	49.48
1906	13,651	703	51.42
1907	14,549	571	39.24
1908	15,878	418	26.32
1909	17,479	396	22.65
1910	19,535	514	26.31
1911	19,947	527	26.42
1912	20,174	493	24.44
1913	20,232	489	24.17
1914	23,265	590	25.36
1915	29,331	640	21.82
1916	24,693	696	28.19
1917	25,386	667	26.27
1918	26,078	616	23.62
1919	26,078	573	21.97
1920	26,078	554	21.24
1921	28,789	497	17.26
1922	31,393	445	14.17
1923	31,285	393	12.56
1924	31,285	475	15.18
1925	31,285	401	12.82
1926	31,285	452	14.45
1927	31,583	423	13.39
1928	32,000	442	13.81[1]



[1] See first paragraph under "Summary of Vital Statistics for Colon," page 23.

MOSQUITO AND MALARIA CONTROL WORK.

As in previous years, our efforts against mosquitoes, particularly the malaria-carrying species of Anopheles, have been chiefly in the direction of *permanent* measures of control, such as filling and drainage, rather than by purely *temporary* measures, such as the use of larvicides. Drainage can be divided into two main categories, (*a*) *preliminary drainage* by open earth ditches, which is normally the first step toward real permanency; and (*b*) *permanent drainage*, which is achieved by the installation of sectional concrete inverts in the bottom of open ditches, or by subsoil tile, usually covered by broken stone.

The only larvicide used extensively here at present is common fuel oil, a petroleum residue, and we have no reason to complain regarding its efficacy or cheapness of application. Our reasons for preferring this oil as a larvicide, and our methods of applying it, are fully described in previous Annual Reports of the Health Department. The present price of fuel oil here is one dollar per barrel of 42 gallons.

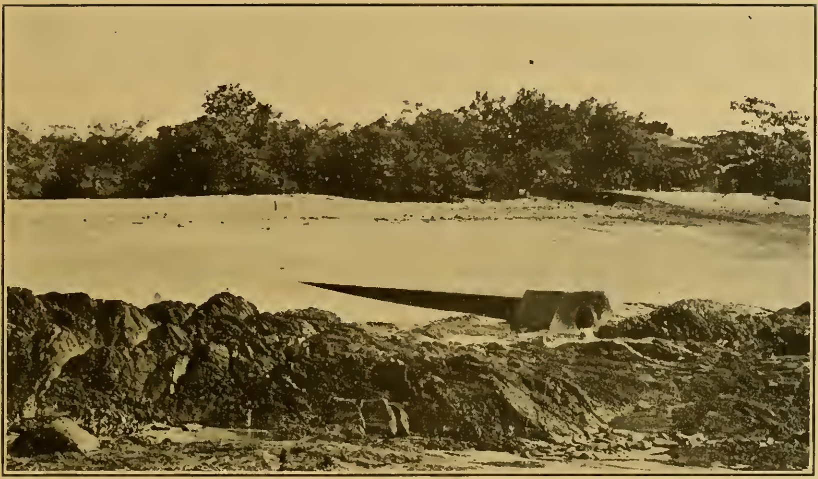
Open earth drains were installed chiefly in newly sanitated areas (the savannas east of Panama City, the environs of labor camps along the Madden highway, and the site of the Madden dam which is to flood the upper Chagres River basin.) Most of the earthen ditches in the savannas are easily maintained at present and it will probably be many years before the city will encroach upon these areas to such an extent as to justify the expense of installing concrete sections or subsoil tile. The drains about the Madden highway are designed to serve during the construction period only, and the need for most of them will probably disappear with the completion of the road two or three years hence. Permanent drainage at the dam site will have to wait at least until the final plans are adopted and construction is under way. The building of a hydroelectric plant and quarters for the operating personnel there will probably justify the installation of a considerable amount of permanent drainage for the control of malaria.

The largest single installation of open-earth ditches this year was on Galeta Island, east of Fort Randolph on the Atlantic side, where some 30,000 feet of sea-level ditches were dug through the mangrove swamps; this undertaking is described more in detail below. (See map No. 3.)

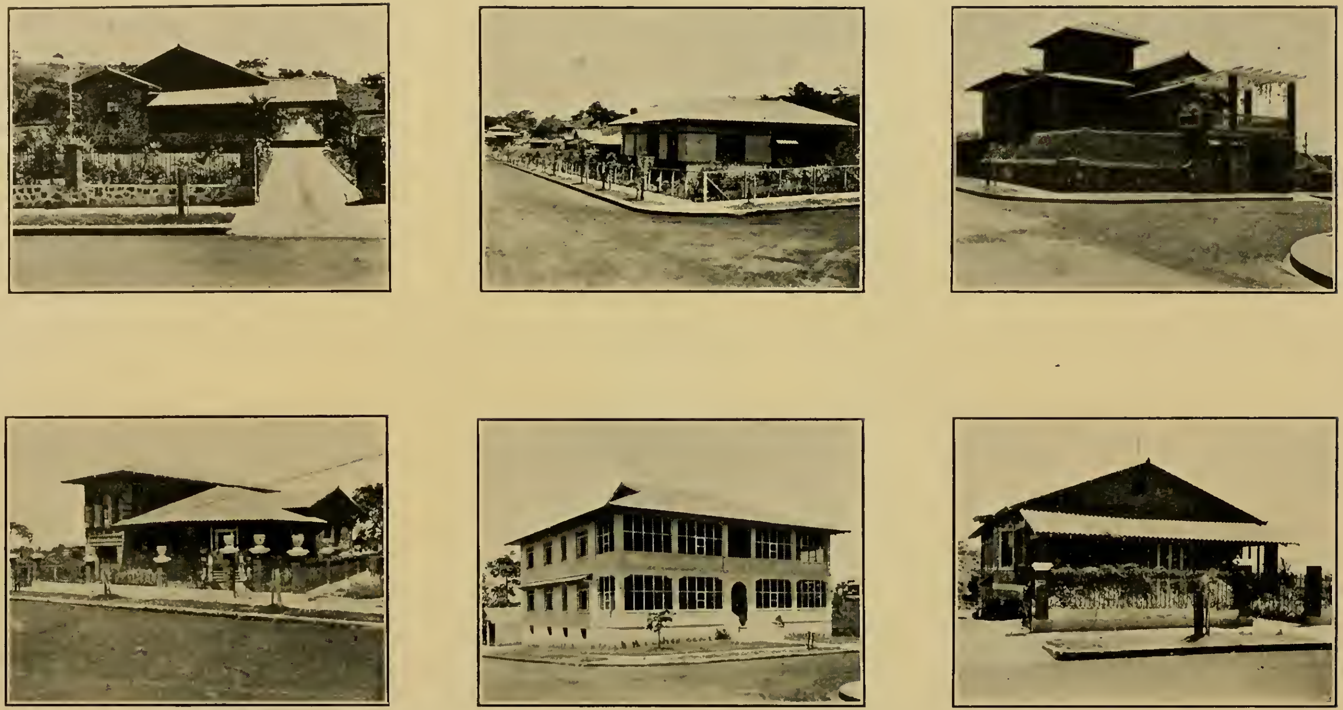
The drainage begun last year in the village of New San Francisco, east of Panama City and the golf club, was this year put in permanent form by the installation of 6,934 feet of rock-covered and earth-covered subsoil tiles, 1,475 feet of open concrete sectional inverts, and 3,900 feet of "double decker." The "double decker" consists of the usual open concrete sectional inverts with six or eight-inch tiles laid immediately beneath them; this combination is designed to carry in the invert a large amount of flood water during the rainy season, and in the tiles a small but continuous flow derived from seepages and constant springs during the dry season. A concrete flume, 20 inches in diameter and 150 feet long, was built through the sandy beach at the outlet of the Rio de los Puercos near the village. (Cut No. 2.) Into this small "river" discharges the entire run-off from more than a square mile of catchment area, including most of the village site, the back part of the Panama Golf Club, and the intervening savannas. Wave action during each high tide shifts hundred of tons of sand, piling it in a long high bar across the outlet of the river. An unusually heavy downpour will cut its way through this sand dike, but ordinary rains formerly served only to keep the flat swamp back of the beach supplied with sufficient fresh water to insure the breeding of hordes of mosquitoes, especially *Aedes taeniorhynchus* and *Anopheles albimanus*. The new 20-inch flume has functioned perfectly, the swampy area back of the beach being completely emptied between succeeding high tides. New San Francisco is located in a region where mosquito breeding is ordinarily controlled only by drainage; it lies beyond the zone in which drainage is supplemented by systematic patrol and oiling of occasional breeding places. Two years ago the village was full of malaria, especially among school children; since the drainage was installed little or none of this disease has occurred among the residents.

About 1,000 feet of subsoil tiles, and 4,350 feet of "double decker" were installed in the drainage system of the small rivulet called "Paso Valiente" near the northeast boundary of the city of Panama, east of the Tumba Muerta road.

Only a few years ago the Health Department was issuing frequent warnings that the beach at Bella Vista, as well as any place beyond the old exposition grounds, was unsafe after nightfall because of the great prevalence of Anopheles mosquitoes about the eastern limits of the city. Now, with *complete* breeding control extending a mile beyond the farthest house in Bella Vista, and with *practically complete* control by means of excellent drainage extending beyond this mile limit along the coast as far as the ruins of Old Panama, the area relatively safe from malaria has expanded eastward far beyond the city limits, including the new extension of Bella Vista. As evidence of changed conditions about Bella Vista resulting from the work of the Health Department, municipal developments are now taking



Cut No. 2.—Concrete flume, 20 inches in diameter and 150 feet long through the sand bar at mouth of small river near the village of New San Francisco. In flood, the river cuts an outlet through the sand on the left at a right angle to the direction of flow through the flume. Each succeeding high tide piles the sand high again, and at times of small precipitation the flume carries the entire run-off of the area. See text page 26.



Cut No. 3.—A few typical residences newly erected in the New Bella Vista section of Panama ,recently sanitated by the Health Department of The Panama Canal. See text page 27.

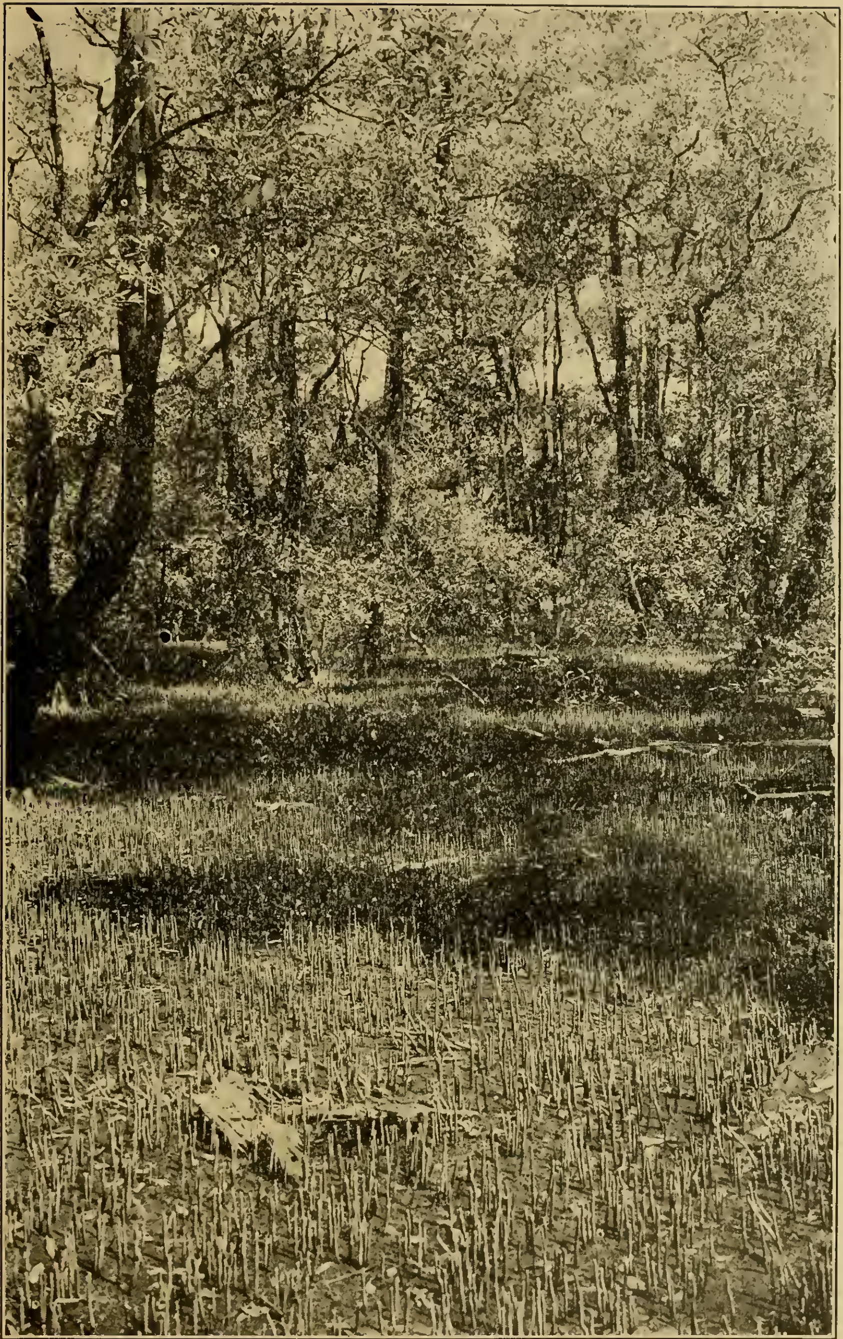
place there at a cost of well over a million dollars; these include grading, paved streets, sewers, water mains, electric conduits, etc. Land values have increased many times, and a beautiful residential section is rapidly arising. (Cut No. 3.) Malaria is now as rare in this area as in the central parts of the city of Panama.

Other work on the Pacific side of the Isthmus included the installation of 3,875 feet of concrete sections and "double decker" and 5,686 feet of rock-covered subsoil tile in Corozal Hospital grounds and vicinity; 3,797 feet of rock-covered subsoil tile were placed along the Panama Railroad near the Miraflores tunnel, and several smaller drains in various locations.

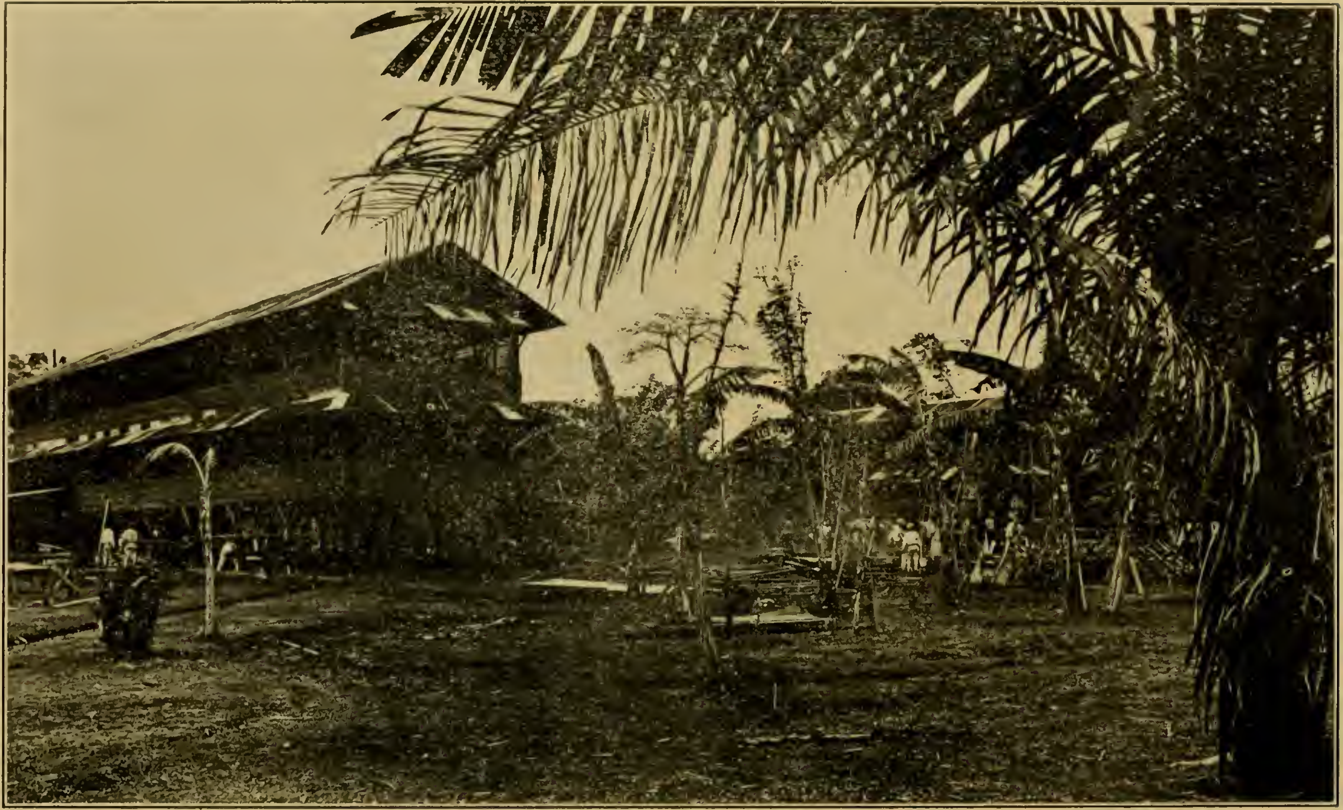
The draining of the tidal swamp on Galeta Island, near Fort Randolph, was one of the most noteworthy undertakings of the last 12 months. (See Map No. 3.) For years past, as has been described in previous Annual Reports of the Health Department, there have been marked flights of *Anopheles tarsimaculatus* and other mosquitoes into Colon city at the beginning of each rainy season, evidenced especially by the presence of these mosquitoes on the front screens of the Washington Hotel and Colon Hospital, which face the beach on Manzanillo Bay. In earlier years mosquitoes were so numerous at these points that it became necessary to kill the resting adults by spraying them with a toxic solution of crude phenol. It has long been believed that these mosquitoes orginated in the swamps east of Fort Randolph, Coco Solo, and France Field. The influx of such species was always greater in those stations than across Manzanillo Bay in Colon. There were no breeding areas closer to the city; in fact, yearly search each rainy season had failed to discover any extensive breeding place for *Anopheles tarsimaculatus* since the draining of the marshy cattle pastures south of Mount Hope. Ditching the swamps east of Manzanillo Bay along the road to the military stations some years ago had reduced materially the number of mosquitoes that composed these invasions into Colon, but there remained an appreciable and apparently irreducible minimum that still would appear with the onset of the rains each year.

Galeta Island, together with a similiar area just south of it, is a large, flat mangrove swamp about one square mile in extent and covered to a greater or less degree every day by the tide. The vegetation is almost exclusively black mangrove (*Avicennia nitida*), having tall, slender trunks about thirty feet high; these trees are rather far apart and bear scanty foliage. About 50 per cent of the ground is constantly exposed to direct sunlight and practically all of the area is bathed in sunshine during some portion of the day. The daily range of the tide at this point on the Caribbean coast is from 12 to 24 inches. The elevation of the surface of the ground in the swamps is about mean sea level, so that the higher tides usually cover the ground to a depth ranging from six inches to a foot. As is common with this type of coastal swamp, the beach on the exposed (northern) side has been built up by coral sand and debris to an elevation slightly above usual high tide level; consequently ordinary tides had access to the swamp, and flood water found an outlet therefrom, solely by way of "Caño William," a tidal estuary separating the island from the mainland. Only an occasional tide of exceptional height, backed by a strong north wind, can surmount the northern rampart and quickly inundate the island. For these reasons, during the time of maximum precipitation in the rainy season, the sea water upon the swamps could become diluted sufficiently to permit most intensive breeding of *Anopheles tarsimaculatus*. (See cut No. 4.)

Galeta Island, as well as the territory south of it for several miles, lies entirely within the reservation set apart for military purposes; consequently the area has been, and still is, under the sanitary control of the Medical Department of the Army. The island has been reported in previous years as free from mosquito breeding, but it is probable that, because of its remoteness and difficulty of access, the attention given to it has not been as close or frequent as was the case in other more accessible places. In the early part of the rainy season of 1928 *Anopheles tarsimaculatus* breeding was found there by the Army authorities; further examination by them and by the Health Department of The Panama Canal revealed the fact that over this entire island the larvae of that species were present in greater numbers than had been seen in recent years upon the Isthmus. It was estimated that the area was yielding perhaps one adult Anopheles daily per square foot at the time the investigation was made. The Army sanitary inspector began to drain the island at once; to expedite this undertaking, the Health Department of The Panama Canal, because of its larger organization and greater availability of funds, agreed to carry the work to completion immediately, the Army furnishing about one-fifth of the necessary labor force. Using Caño William, an estuary which connects with the sea at either end, as one outlet, another channel, about six feet wide and three feet deep, was dug from the western mouth of the Caño, parallel to and south of the high-banked northern sea-front of the island; this new channel discharges at its other end into the sea on the eastern side of the island. Within the V-shaped area between these two main channels, and opening into them at each end, a series of parallel ditches three feet



CUT NO. 4.—Mangrove (*Avicennia nitida*) swamp on Galeta Island, recently drained by the Health Department of The Panama Canal. In this swamp before canalization, the brackish water stood throughout from six inches to a foot or more deep. It appeared to be the sole source of the *Anopheles tarsimaculatus* that annually invaded Colon and the intervening Army and Navy posts. See text page 28.



Cut No. 5.—Screened barracks at temporary jungle camp No. 2 of the Madden Road project. At left, quarters of silver (mostly colored alien) laborers. At right, quarters of gold (white American) personnel and offices. In the basement of each building is a kitchen and dining room. Screened sleeping quarters, good nourishing food, and a minimum amount of local mosquito control appear to give a practical degree of control of malaria among these workers. See text page 29.

wide and two feet deep was dug; these were spaced at intervals of 500 feet. The bottoms of all the ditches are well below the lowest tide level. Quick run-off of storm water may now be expected, however heavy the rainfall.

Practically complete control of mosquito breeding resulted at once from these ditches, but several years must pass before we can be assured that these swamps were the sole source of the flights into the nearby military posts and the city of Colon, over two miles away. It is interesting to note that the catches at the Washington Hotel and Colon Hospital during previous years had included, along with *Anopheles tarsimaculatus*, adults of *Culex nigripalpus* and *Culex psatharus* (the larvae of the latter having been unknown here previously). Before draining Galeta Island the larvae of both these species were found breeding freely there. This is strong presumptive evidence that our Colon flights originated in this island.

The proposed new dam and lake in the upper Chagres River basin, and the new highway leading thereto, are, by act of Congress, to be known as Madden Lake, Madden Dam and Madden Highway. The roadway, which is now under construction will be of heavy reinforced concrete, 13 miles long from the dam site near Alhajuela to the junction point with the present Gaillard Highway near Summit in the Canal Zone; most of it will be located in the Republic of Panama, although its termini will lie within the Canal Zone. The exact site of the dam has not yet been decided upon, its location depending upon the decision of geologists who are now investigating the rim of the basin In these undertakings about 1,000 men have been engaged for the past six months.

The sanitary needs of the work have been considered from the very inception of the plans, provision being made to give the working forces as much protection against malaria and other infectious diseases as is practicable. The men have been concentrated in camps located not only as regards accessibility to the work, but also with due consideration of water supply, drainage, and other features. There are at present two labor camps along the right of way, one within the Canal Zone two miles from the Gaillard Highway, the other in the Republic of Panama five miles further on toward Alhajuela; a similar camp is provided near the proposed dam site. At each camp there is a building for the laboring force (colored or "silver") and a separate one for the supervisory (white or "gold") force and for offices. *These houses are thoroughly screened throughout with heavy 16-mesh copper wire netting.* Every person is required to sleep within the screens. Offices, kitchens, and gold messes are likewise screened. (See cut No. 5.)

The wood of the buildings has been painted with coal-tar creosote and measures are taken constantly to prevent the development of annoying vermin in the quarters. Attention has been given to the selection and protection of the water supplies. A garbage incinerator and a septic tank have been built at each camp. The immediate campsites have been drained and this work will be extended as the indications for it are perceived. A white sanitary inspector makes weekly or more frequent trips to each camp, and a colored sanitary laborer is detailed at each one to make daily patrol of the areas. The latter looks out for and controls local fly and mosquito breeding, makes nightly flight observations and catches of mosquitoes on the wing, and daily catches of any resting mosquitoes which have gained access to the quarters. All mosquitoes taken are sent in to the sanitary inspector for identification. Quinine solution is provided for those who will avail themselves of it, but the amount of malaria incurred so far has not justified its compulsory administration to every employee there.

The labor forces for the Madden projects have been recruited largely from the neighboring country and towns; some are from Panama City, but most of them belong to the agricultural class living in small villages and scattered settlements in unsanitated parts of the Zone and the Republic of Panama. The homes of many of the laborers are so near the work that the owners of them spend at least the weekend, if not every night, with their families. Very many of the natives are already infected with chronic malaria at the time of their employment and frequent visits to their homes after dark offer opportunities for infection while they are employed on this undertaking. Nearby villages outside the Canal Zone, with their public bars, attract many of the men during their evening hours of leisure. These resorts, none of which are sanitated or located in especially salubrious spots, furnish far more favorable opportunities for infection with malaria than do the labor camps themselves. Effectively to sanitate these outlying places, as well as the nearer environs of the camps, would require, for a while at least, nearly as large a force as is now engaged in actual construction work. The temporary nature of the road camps does not justify expenditure for any great amount of permanent control work about them.

Developments at the dam site will be of a more permanent character. Here, between the limestone bluffs of the upper Chagres River, will be reared a massive concrete dam, impounding a deep lake over 22 square miles in area. A spillway and a hydroelectric plant, with quarters for the operating personnel and their families, and perhaps other accessory structures, will be erected. Until these things are definitely planned, but little sanitation of a really permanent nature will be justified; the work of the Health Department for the protection of the construction forces will necessarily be very similiar to that which was carried out during the years in which the Canal was being built.

The recent death of Dr. H. G. Dyar of the United States National Museum at Washington, D. C., is a great loss to those interested in mosquitoes or their control. In addition to the immense value of his published works on mosquitoes, his assistance in the determination of specimens and the description of new species sent him was invaluable to us. His interest and enthusiasm never flagged. To every member of the sanitary organization of The Panama Canal his death is a keenly felt loss. Fortunately, and largely through Dr. Dyar's published tables and descriptions of the mosquitoes of Panama, some of the personnel of the health department have in recent years developed considerable ability in the identification of mosquitoes; work of this character on the known species has become practically a routine measure here. Every sanitary inspector engaged in mosquito control has learned to identify our local larvae; one of the most expert in this work is a colored West Indian clerk in the sanitary inspector's office at Ancon. The assistant chief health officer has in his home a well-equipped laboratory and is making determinations by means of the male genitalia. It had previously been thought that the mounting and study of the male genitalia of mosquitoes were only for experts in the museums and the larger institutions, but it now appears that the field worker may engage in it with great practical benefit. One of the sanitary inspectors has also undertaken this branch of the indentification and finds it an interesting and useful acquisition. Outside of a good microscope, the paraphernalia for preparing hypopygial mounts are simple and inexpensive, and the necessary dexterity is easily acquired.

A recent determination by this method revealed the presence in the Canal Zone of *Anopheles* (*Nyssorhynchus*) *bachmanni* Petrocchi, whose occurrence here had not previously been suspected. Probably owing to its great similarity to *A. albimanus* and *A. tarsimaculatus* it had escaped recognition, although now that it has been identified it appears to have specific characters of coloration on palpi, wings, and legs by which it may be differentiated from these with a hand lens. *A. bachmanni* was first described in 1925.[1] Dr. and Mrs. Bonne.[2] undoubtedly mistook it for *A. tarsimaculatus* in Surinam, since their description and illustration of the hypopygium of the latter species are clearly of *A. bachmanni.* The larvae of this mosquito, hitherto undescribed, were also found here and will be described elsewhere. They were discovered unassociated with other *Anopheles* larvae inside the crowns of waterlettuce (*Pistia stratiotes*) growing in the Paja River arm of Gatun Lake; from one to many individuals of various sizes were taken from single plants. Remote parts of the lake are at times solid beds of floating waterlettuce. The larvae have since been collected at various places in the Zone, *but only in the crowns of Pistia*, so it would appear that this plant is the normal habitat of the species.

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[1] Rev. del Inst. Bact. del Dep. Nac. de Hyg. iv, 69, 1925.

[2] Bonne and Bonne-Wepster, Mos. of Surinam, Royal Colonial Inst. of Amsterdam (Holland), No. xxi, Afd. Trop. Hyg. No. 13,511, 1925.

Dr. Dyar states that *A. bachmanni* is "doubtless a dangerous malaria carrier."[1] Probably throughout those regions of the lake where *Pistia* abounds it will prove to be the dominant species of *Anopheles;* it does not appear in the hand catches made in and about the Canal Zone towns or the labor camps of the Madden project. Fortunately, the dredging division of The Panama Canal, in its attack with poison sprays upon those obstructions to navigation, the waterhyacinths (*Piaropus azureus* and *P. crassipes*), also incidentally destroys the waterlettuce with which these hyacinths are usually associated; as a result, large areas of the lakes are kept free from *Pistia*, which would otherwise present a far greater problem of mosquito control in the event that *A. bachmanni* proves to be a really important malaria carrier. The *Anopheles* that once bred freely in the Cocoli River arm and other parts of Miraflores lake, were probably of this species instead of *A. albimanus* as was formerly thought, but for some years past they have been controlled by spraying the floating beds of waterlettuce with fuel oil. Although the larvae seem to inhabit solely the crown of the waterlettuce, the fine mist of heated oil that falls from the spray-nozzles results in a film that spreads thoroughly into every nook and cranny amongst the nearby vegetation. Frequent search of these areas indicates that the control of breeding is complete in a bed of waterlettuce that is oiled by the methods we have so frequently described in our reports for past years.

Another Anopheles recently found by genitalic determination to be more prevalent on the Isthmus than had theretofore been suspected is *A. evansi* Brethes (*strodei* Root). Owing to its great similarity to *A. tarsimaculatus* (especially the adults) the species had been recognized from this locality but once in previous years, and that in a specimen sent Dr. Dyar from Stillson's Lake at Gatun, in 1924.[2] For some years larvae believed to be those of *A. tarsimaculatus* have been found on the Pacific side of the Isthmus in breeding places that were not thought to be typical for that species. Probably routine identification of specimens by characters of the male genitalia will throw much light on some hitherto puzzling questions.

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[1] Dyar, H. G., The Mosquitoes of the Americas,—Carnegie Institute of Washington publication No. 387, page 435, May, 1928.

[2] Root, F. M., Studies in Brazilian Mosquitoes. I. The Anophelines of the Nyssorhynchus Group.—*Am. Jour. Hyg.*, *VI*, 711, 1926.

HEALTH OFFICE OF THE CITY OF PANAMA.

Dr. Henry Golthwaite, Health Officer.

Infant mortality.—The death rate of children under 1 year of age per 1,000 live births for the past five years has been:

1924	138
1925	117
1926	144
1927	120
1928	148

Tuberculosis.—There were 227 deaths from tuberculosis, giving a rate of 3.79 per 1,000 population. The tuberculosis curve for the city of Panama remains practically stationary and will probably remain so until such time as the present overcrowded rooming conditions of the poorer classes are overcome by better and more adequate housing conditions.

Communicable diseases.—The following cases were reported:

Chickenpox	93	Pneumonia (deaths)	248
Diphtheria	182	Poliomyelitis	3
Dysentery, amebic	15	Relapsing fever	2
Dysentery, bacillary	2	Tetanus	2
Leprosy	5	Trachoma	1
Measles	101	Tuberculosis (deaths)	227
Meningitis, meningococcic	2	Typhoid fever	6
Mumps	310	Whooping cough	17
Paratyphoid fever	2		

When a case of diphtheria is reported cultures are taken from all contacts and sent to the Board of Health Laboratory. One thousand seven hundred and thirty-nine cultures were taken and examined and 22 of these proved positive for Klebs-Loeffler bacillus. With the exception of tuberculosis and whooping cough, the majority of the contagious and infectious disease cases were sent to Santo Tomas Hospital.

One case of smallpox was reported which originated in Cartagena, Colombia.

Vaccinations.—There were 9,530 vaccinations done and 323 vaccination certificates were issued. Most of the latter were for outgoing passengers on various steamship lines which will not issue a ticket to any Latin-American country without the exhibition of a vaccination certificate from the Health Department.

Building inspections.—There were 1,060 building permits issued, as follows:

New buildings	97
Repairs and alterations, including ventilation and rat-proofing	442
Miscellaneous	412
For installation of bars, fixtures and counters in business houses and rat-proofing same	109

All such construction, alterations, repairs and installations were closely supervised to make sure that the required rat-proofing was properly done.

Milk and dairy inspections.—There are 27 dairies which supply milk to the city of Panama, a small part of the output being sent to the Canal Zone and to Colon. The dairy herds have a total of 2,276 animals; 176 head of dairy cattle and calves were imported from Costa Rica and 88 from the United States during the year; 72 head of cattle were exported.

There were 2,197 dairy animals tested for tuberculosis, of which 5 were found to be reactors and were destroyed. (See page 7 in letter of transmittal.) Two hundred and sixty-nine cows were removed from various herds on account of being unprofitable; of this number 2 were slaughtered for beef, and the rest were sent to the interior of the republic. Because of poor production and operating at a loss, 2 dairies voluntarily closed during the past 12 months.

Of the 27 dairies in active production, all but 3 have entered into the *Central de Lecherias*. This organization has erected a building in accordance with plans suggested by the Health Department, and early in the coming year will install therein a thoroughly up-to-date pasteurizing plant with a capacity of 15,000 bottles daily; the total cost will be approximately $50,000. The 3 dairies not in the "*central*" will pasteurize and bottle in a new plant, modern in every respect, and having a capacity of 1,200 bottles per day.

The production per cow during 1928 was greater than in previous years, largely owing to the weeding out of poor producers. Of the 2,276 dairy animals 360 cows and 12 bulls are pure-bred. Six pure-bred animals died during the year, 2 of septicemia, and 4 of *Piroplasma bigeminum.*

The milk production averaged 5,540 one-fifth gallon bottles daily or 33,240 gallons per month; based upon a population of 70,000, the daily supply per capita was one and three-tenths ounces. It is of interest to know that in March, 1920, the monthly output of all of the dairies supplying milk to the city of Panama was but 8,287 gallons. Until that date no milk was pasteurized and only a small portion was sold in sanitary bottles; the retail price then (1920) was 40 cents per one-fifth gallon bottle; the general price now is 17½ cents per bottle, pasteurized. The lowering of the price has been brought about by increasing volume, weeding out poor producers and introducing modern methods of feeding.

About 40 gallons of fresh milk are used daily in the manufacture of ice cream, and early in the coming year all ice cream sold in Panama City will be manufactured in modern, up-to-date plants.

Garbage disposal.—The garbage from the city of Panama, the Ancon-Balboa District, Fort Amador, and Quarry Heights is now disposed of at the old dump in the Calidonia section of the city. The use of heated fuel oil to spray the garbage and its earth covering for the prevention of fly-breeding continues to be satisfactory. Ninety-seven thousand one hundred and fifty-four cubic yards were collected and buried at an approximate cost of $0.697 per cubic yard.

Veterinary work.—At the municipal abattoir 14,323 cattle were slaughtered, of which 38 were condemned as unfit for food, as follows: Congestion 12, tuberculosis 1, septicemia 12, exhaustion 1, gangrenous wounds 1, pneumonia 5, acute inflammation 1, moribund 1, and unknown (dead in corral) 4.

There were 14,530 hogs slaughtered at the municipal abattoir of which 682 were condemned as unfit for food, as follows: Cysticercosis 445, cholera 166, pneumonia 59, icterus 1, septicemia 2, and unknown (found dead) 9.

Inspections were made of 10,697 cattle and 6,269 hogs for shipment to the Atlantic side. Certificates were issued for 22,756 hides derived either from animals slaughtered at the municipal abbatoir, which had received ante- and post-mortem examination, or from animals slaughtered in the interior, hides from which were disinfected under the supervision of our veterinarians.

General work.—There were 79,769 house-to-house inspections made by the house gangs; 880 mosquito-breeding places were found and destroyed. A total of $384 in fines was collected for violations of the sanitary rules and regulations. Of 15,037 rats and mice caught in the city; 5,731 were sent to the Board of Health Laboratory at Ancon for examination and were classified as follows: *Mus musculus* 3,005, *Mus alexandrinus* 16, *Mus norwegicus* 438, and *Mus rattus* 2,272. None of these rodents was found to be infected with plague.

HEALTH OFFICE, COLON-CRISTOBAL.

Dr. J. L. Byrd, Health Officer.

Communicable diseases.—The following cases were reported from Colon:

Anthrax	1	Mumps	87
Chickenpox	29	Relapsing fever	1
Diphtheria	22	Scarlet fever	2
Dysentery amebic	2	Smallpox	1
Hookworm	53	Trachoma	1
Leprosy	2	Tuberculosis (all forms)	63
Malaria	37	Typhoid fever	6
Measles	39		

There was one fatality from a disease diagnosed clinically as diphtheria, death probably being due to delay in seeking medical attention; cultures from the throat were negative. There were 4,065 persons vaccinated against smallpox. The regulation requiring vaccination of infants at 3 months of age was enforced.

Cristobal Woman's Club free clinic.—The clinic is operated jointly by the Cristobal Woman's Club and the Health Department, primarily as an infant welfare center for the nonemployees of Colon. The health officer is the director of the clinic and the visiting nurse is in immediate charge. Feedings are provided for approximately 35 babies and mothers daily. The following table gives the number of treatments given in this clinic during the year:

Babies (under 5 years)	11,347
Mothers, prenatal and postnatal	1,199
Dental	49
Eye, ear, nose, and throat	1,339

The following donated their services for this work: Dr. DaCosta Gomez and Dr. C. A. Hearne, prenatal and infant welfare; Dr. Harry Eno, eye, ear, nose, and throat; Dr. H. A. Doten, dental.

Infant mortality.—The infant mortality rate per 1,000 live births for the past eight years has been as follows:

1921	139	1925	117
1922	140	1926	129
1923	116	1927	109
1924	114	1928	104

Diarrhea and enteritis were the principal cause of death in infants under one year of age.

Building inspection.—Sixty-five permits for new buildings and 1,013 permits for repairs and alterations to existing buildings were issued; 37 permits to occupy new buildings were issued. All buildings covered by these permits were rat-proofed in accordance with the building regulations.

Garbage disposal.—Garbage from Colon, Cristobal, and France Field is disposed of by the burial method, which has proved thoroughly satisfactory in every way. Fly breeding is controlled by the use of crude oil applied hot with a knap-sack spray. The burial system, as compared with the former method of incineration, is effecting a saving of approximately $10,000 annually, about three-fourths of which accrues to the benefit of the city of Colon and one-fourth to the benefit of the Health Department.

Mt. Hope cemetery.—The gross receipts from burials was $3,206 and from sale of flowers $1,301.75. The cemetery occupies an area of approximately 50 acres and has 13,000 marked graves; it costs the Health Department approximately $7,300 yearly to maintain.

Veterinary work.—At the Colon abattoir 4,344 cattle were slaughtered. Of these, 7 were condemned because of bruises, 2 because of emaciation, and 1 on account of septicemia. Four quarters were condemned because of bruises. Two hundred and sixty-five other parts and 4,800 pounds of bruised meat were condemned. Of 7,609 hogs slaughtered, 364 were condemned because of cysticercosis, 29 because of cholera, 11 because of pneumonia, 8 because of emaciation, 7 because of bruises, 7 because of empyema, 1 because of septic metritis, 1 because of kidney worms and pus contamination. Twenty-two hundred and eight parts were condemned.

At the Mount Hope abattoir 8,011 cattle were slaughtered, and of these 5 were condemned on account of being in a dying condition, 6 on account of emaciation, 6 on account of external bruises, 2 on account of pneumonia, 1 on account of empyema, 1 on account of pus contamination, and 1 on account of septicemia. Thirty quarters were condemned on account of bruises and 9 on account of abscesses. One carcass was held on account of cysticercosis but passed for food after refrigeration for 21 days. Other parts (livers, heads, hearts, etc.) were condemned to the number of 579.

Thirteen dairies in the Cristobal-Colon area produced, pasteurized, and bottled 1,732,728 pounds of milk. From Panama, 158,700 pounds of milk were received, bottled and distributed. Imported frozen milk from the States amounted to 94,600 pounds.

Quarantine inspections for the purpose of permitting entry into the Canal Zone were made of 328 dogs, 393 cattle, 58 mules, 35 horses, 51 hogs, 12 goats, and 105 circus animals.

PHYSICAL EXAMINATION OF SCHOOL CHILDREN.

There were 3,307 school children given the annual physical examinations, the following defects being revealed:

Defective vision	171	Enlarged thyroid	2
Defective hearing	38	Bronchitis	3
Hypertrophied tonsils	282	Orthopedic defects	6
Defective nasal breathing	42	Psoriasis	1
Defective teeth	412	Undescended testicle	1
Cardiac lesions	14	Mammary cyst	1
Circumcision advised	19	Nervous disorder	2

The colored school children of the Canal Zone were also examined.

DIVISION OF QUARANTINE.

Dr. M. F. Haralson, U. S. P. H. S., Chief Quarantine Officer.

Operations of the quarantine division have continued as in years past. No change in quarantine procedure has been instituted and no additional rules or regulations have been promulgated.

Two stations are operated by the division, one at Balboa, and the other at Cristobal; there are four medical boarding officers and one quarantine inspector on duty at each, together with the necessary colored personnel for the performance of duties. Barrack buildings and equipment for the care and detention of about 400 persons are maintained at the Balboa station.

A strict inspection was maintained to prevent the entrance of quarantinable diseases into the Canal Zone. This inspection was prompt and efficient, with no delay to shipping. It was not necessary to detain in quarantine a single ship on account of the presence of disease on board.

The method of fumigating ships was greatly simplified, and the time consumed in fumigation was materially reduced, by the adoption of a new preparation, Zyklon-B. This fumigant is liquid hydrocyanic acid incorporated in a calcined and granular silicious earth. The material in concentrated form under pressure is packed in tins of convenient size and is easily handled. Its use lessens the labor of fumigation. There is practically no residue remaining and no equipment is required. In the past it has been necessary to load on to a vessel bulky equipment for generating gas, and after fumigation to remove it.

The "International Standard Form Bill of Health" was adopted by The Panama Canal on May 16, 1928. This has proved and will continue to prove of material aid to shipping, as it makes for uniform quarantine procedure by all the member countries. Vessels clearing from the Panama Canal direct for ports of the United States, and having this form of bill of health in their possession, are exempted from quarantine inspection upon arrival there, with resultant saving of time and lessening of fees incident to entering port.

The physicians on duty in the quarantine division are also the immigration officers for The Panama Canal, and they also act in this capacity for the Republic of Panama.

The following table summarizes the activities of the quarantine division for the year:

Vessels inspected and passed	3,925
Vessels passed on sworn declaration of master	3,405
Vessels passed by radio	107
Total vessels	7,437
Supplementary inspection of vessels	5,380
Crew inspected and passed	239,868
Crew passed on sworn declaration of master	148,573
Crew passed by radio	3,555
Total	391,996
Passengers inspected and passed	104,167
Passengers passed on sworn declaration of master	30,028
Passengers passed by radio	1,440
Total	135,635
Persons detained under immigration law	703
Persons deported under immigration law	1,088
Total	1,791
Vessels fumigated	128
Box cars fumigated (containing animal food stuff)	57

GORGAS HOSPITAL.

(Capacity 800 patients.)

COL. GEO. M. EKWURZEL, Medical Corps, U. S. Army, Superintendent.

Administration.—By Joint Resolution of Congress, approved March 24, 1928, the name of this institution was changed from "Ancon Hospital" to "Gorgas Hospital" as a tribute to the memory of Major General William Crawford Gorgas.

Under the Executive Order of November 3, 1928, Corozal Hospital was removed from the jurisdiction of Gorgas Hospital.

Enlargement and improvement of clinics.—More adequate facilities for care of out-patients by the medical service and the eye, ear, nose, and throat service were provided during the year. The basement under sections "C" and "D" was improved by additional windows and the property storeroom was moved to provide space for storage of clinical histories, formerly stored in the administration-clinics building. The chart file room in the latter building was converted into a suite for the medical out-patient clinic, consisting of 2 offices, 4 examining rooms, nurse's room and laboratory. Hospital artisans manufactured the following furniture for use in the clinic: 4 desks, 4 examining tables, 4 library tables, 4 examining stools, 3 typewriter tables, 5 file baskets. In addition, the room formerly occupied by the assistant superintendent was set aside for the office of the chief of medical service. The assistant superintendent's office is now adjacent to the office of the superintendent.

The suite on the first floor of the administration-clinics building, formerly occupied by the medical service, was added to that already used by the eye, ear, nose, and throat service; the whole was reconstructed and equipped to provide an additional operating room, four examination and treatment rooms and an office for the chief of the service. Additional desks and other furniture were also manufactured by hospital artisans for this service. (For the costs of these and following improvements, see letter of transmittal, pages 8 and 9.)

Dental department.—Three rooms on the third floor of the administration-clinics building were prepared and fully equipped for the use of the newly established dental service, By March all operating apparatus and equipment were installed and in use; in September a dental X-ray unit was added.

Additional private rooms.—The work of providing additional private rooms and private suites in section "A" was commenced and should be completed early in 1929.

Wards.—Ward 3, in section "A," and ward 9, in section "C," have been set aside for the exclusive use of white and colored patients, respectively, who are suffering from affections of the eye, ear, nose, or throat.

Maintenance and repairs.—The usual work of maintenance of and repairs to hospital buildings and equipment was performed. In addition, there was a great deal of new work undertaken and many articles of furniture and equipment were manufactured, the more important items being as follows:

Section "A"—1 bookcase, grading in basement; Section "B"—private rooms repainted, eight surgical beds added to equipment, electric sterilizer installed in delivery room; administration-clinics building—windows cut in walls of stairways to provide adequate lighting; board of health laboratory—built-in bookcases, outside woodwork repainted, 3,000 tissue section blocks and 100 wood slide trays manufactured; undertaking department—228 coffins manufactured; kitchen-mess-halls building—foundations strengthened, tile floor laid in mess pantry; a power bread-slicing machine and 20 dining tables were added to the kitchen equipment; X-ray clinic—a new X-ray bedside unit and a new stereoscopic viewing apparatus were added to the equipment; garage and motor transportation—wooden doors were replaced by iron gates at each stall and a shed provided for the gasoline pump, new bodies were constructed for 3 trucks, 3 ambulances were repainted; nurses' quarters—temporary quarters for female nurses, necessitated by increase in staff in 1927, were provided at first in section "A" and later on the second floor of building 217, hospital artisans manufactured 5 porch screens, 14 dry closets and a bookcase for use in the nurses' quarters; in the concrete quarters for nurses, the wooden floor was replaced by a cement floor in 9 rooms; physiotherapy service—a new arm and leg whirlpool bath and a mahogany bookcase were installed; sanitary inspector, Ancon—complete construction of motor launch "Sandpiper" and installation of motor by hospital artisans.

Surgical service.—There were 1,139 major operations, and 4,060 minor operations, including intravenous injections of arsphenamin; 4,958 cases visited the out-patient department; and 415 obstetrical cases were delivered, in which there were 6 twin births and 29 stillbirths. *Medical service.*—There were 8,594 cases treated in the out-patient department, an increase of one-third over 1927, and more than double the number for 1926. *Dental service.*—Established in March, there were 2,472 sittings during the year, 697 oral examinations, 997 teeth extracted. In the period September to December, inclusive, 212 complete dental X-ray and 114 partial dental X-ray examinations were made. *Eye, ear, nose, and throat service.*—There were 14,056 visits to the out-patient department; 2,072 operations were performed, and 1,337 refractions were made. *Radiographic service.*—There were 6,245 cases handled, for which 13,856 films of various sizes and 2,922 dental films were used; 922 fluoroscopic examinations were made. *Radiotherapeutic service.*—Treatments were given to 915 hospital patients and 1,279 out-patients, as follows: Radium therapy, 239; X-ray therapy, 251; physio-therapy, 786; hydro-theraphy, 654;

photo-therapy, 111; massage, 43; electric baking, 105. *Nonresident patients.*—830 patients, whose residences were outside of the Canal Zone or the cities of Colon and Panama, were treated during the year.

SURGICAL SERVICE. REPORT OF OPERATIONS.

	Number.	Died.
Amputations:		
Arm	1	
Forearm	1	
Thigh	2	
Leg	2	
Digits, multiple	4	
Operations on bones:		
Ostiectomy	7	
Resection of tibia	1	
Wiring of fracture, simple	8	
Plating of fracture, simple	7	
Plating of fracture, compound	1	
Reduction of fracture, simple	95	
Reduction of fracture, compound	3	
Adenectomy:		
Cervical	3	
Axillary	1	
Inguinal, single	134	
Inguinal, double	12	
Femoral	2	
Herniotomy:		
Inguinal, single	134	1
Inguinal, double	9	
Femoral	1	
Ventral	4	
Combined	1	
Strangulated	1	
Genito-Urinary tract:		
Nephrotomy	5	
Perinephritic abscess, drainage of	1	
Ureterotomy	1	
Cystotomy	4	
Urethrotomy, internal	22	
Urethrotomy, external	22	
Prostatectomy	4	
Varicocele, radical cure	5	
Hydrocele, single, radical cure	40	
Hydrocele, double, radical cure	1	
Orchidectomy	4	
Vasectomy	1	
Curettage uteri	361	
Perineoplasty	29	
Trachelorrhaphy	23	
Vaginal puncture	8	
Epididymotomy	105	
Obstetrical:		
Cesarian section, abdominal	7	3
Cesarian section, vaginal	2	
Forceps delivery	4	
Version	1	
Perineorrhaphy	1	
Breech extraction	1	
Thorax:		
Thoracotomy	7	
Excision of breast	3	
Excision of breast and axilla	4	
Rectum:		
Hemorrhoids, radical cure for	144	
General:		
Thyroidectomy	17	
Tenorrhaphy	3	
Gunshot wound, soft parts, operation for	1	
External injury, soft parts, operation for	1	
Plastic operation for congenital defect	3	
Plastic operation for severe injury	1	
Plastic operation for effects of disease	6	
Skin graft	1	
Varicose veins, excision of	17	
Laparotomy:		
For general peritonitis	3	2
For intestinal obstruction	1	1
Exploratory	21	
Gastrotomy	3	
Gastro-enterostomy	10	1

SURGICAL SERVICE. REPORT OF OPERATIONS—Continued.

	Number.	Died.
Laparotomy—Continued:		
Entero-enterostomy	5	
Enterectomy	4	1
Enterorrhaphy	10	
Appendectomy	241	
Appendectomy with local peritonitis	14	1
Appendectomy with general peritonitis	3	2
Appendicostomy	1	
Colostomy	1	
Sigmoidopexy	1	1
Resection of rectum	2	
Cholecystectomy	12	
Cholecystotomy	3	
Cholecystostomy	10	
Choledochectomy	3	
Splenectomy	1	
Pan-hysterectomy	9	
Supravaginal hysterectomy	90	
Hysteromyomectomy	33	
Myomectomy	4	
Salpingostomy, single	10	
Salpingostomy, double	10	
Salpingo-oöphorectomy	10	
Ovarian cystostomy	1	
Oöphorectomy	27	
Suspensio uteri	86	
Pyloroplasty	1	
Operation for ectopic gestation	1	
For trauma:		
General peritonitis	1	1
Stab wound of abdomen	1	
Perforated gastric ulcer, with closure	2	
Gastrectomy, sub-total	1	1
Other major operations	9	
Minor operations, various	1,903	2
Circumcision	246	
Cautery	41	
Novarsenbenzol	1,862	
Blood transfusion	8	
Totals	5,999	17
Obstetrical cases (6 twin births)	415	

EYE, EAR, NOSE, AND THROAT SERVICE. REPORT OF OPERATIONS.

Eye:	
Cataract, linear	11
Cataract, simple	4
Cataract, combined	6
Chalazion removal	40
Enucleation	6
Foreign body, removal of	46
Hordeoleum, incision of	6
Iridectomy	7
Lachrymal operations	3
Dissection of sac	4
Lid operations—	
Expression	1
Plastic	1
Tarsectomy	4
Needling	21
Paracentesis	4
Pterygium	58
Sclerotomy	1
Scleral trephine	7
Capsulectomy	1
Other operations	10
Ear:	
Furuncle, incision of	2
Foreign body, removal of	6
Mastoid, simple	20
Mastoid, radical	1
Paracentesis	33
Polypi, removal of	3
Nose:	
Foreign body, removal of	8
Plastic	1
Nose—Continued:	
Polypi, removal of	15
Rhinoplasty	6
Sinuses—	
Ethmoid, simple	2
Ethmoid, radical	3
Frontal, simple	10
Frontal, radical	2
Maxillary, radical	6
Maxillary, puncture and drainage	57
Sphenoid, simple	4
Reduction of fracture	2
Submucus resection	85
Turbinectomy	12
Other operations	9
Pharynx:	
Adenoidectomy	460
Peritonsillar abscess, incision	35
Retropharyngeal abscess, incision	1
Tonsillectomy	1,029
Uvulectomy	1
Other operations	10
Trachea:	
Tracheotomy	2
Larynx:	
Foreign body, removal of	2
Radium implant	4
Total	2,072
Refractions	1,337

X-RAY SERVICE. REPORT OF ACTIVITIES.

Total number of cases handled		6,245
Nature of examinations:		
Ankle	141	
Abdomen	16	
Chest	1,548	
Colon	41	
Dental [1]	497	
Elbow	79	
Femur	128	
Fluoroscopy	33	
Foot	163	
Forearm	106	
Foreign body	24	
Gall bladder	120	
Gastro-intestinal series	440	
Fluoroscopy in connection with G. I. series	889	
Gastric	23	
Genito-urinary tract	232	
Hand	174	
Hip	70	
Humerus	29	
Jaw	65	
Knee	183	
Nature of examinations—Continued:		
Leg	151	
Localization	8	
Mastoid	69	
Neck	4	
Esophagus	4	
Pelvis	44	
Shoulder	137	
Sinuses	256	
Skull	167	
Spine	270	
Wrist	113	
Animal	1	
Pathological specimen	1	
Classification of films used:		
8x10	2,764	
10x12	5,528	
14x17	5,564	
Dental [1]	2,922	

[1] Dental X-ray unit installed in dental service September, 1928.

PHYSIO-THERAPY SERVICE. REPORT OF ACTIVITIES.

Radium:		
Hospital patients		75
Outpatients		164
Number of treatments		463
Classification of diseases—		
Malignant	56	
Nonmalignant	183	
Roentgen therapy:		
(Apparatus out of order and idle the last six months of the year).		
Hospital patients		72
Outpatients		179
Number of treatments		1,123
Classification of diseases—		
Malignant	40	
Neurological	8	
Skin	164	
Tuberculosis	1	
Other nonmalignant	38	
Physiotheraphy:		
Hospital patients		326
Outpatients		460
Number of treatments		5,185
Classification of diseases—		
Skin	282	
Neurological	238	
Muscular	117	
Tuberculosis	59	
Other conditions	99	
Hydrotherapy:		
Hospital patients		243
Outpatients		411
Number of treatments		3,756
Classification of diseases—		
Joints	203	
Neurological	141	
Muscular	67	
Obesity	92	
Other	147	
Phototherapy:		
Hospital patients		77
Outpatients		34
Number of treatments		968
Classification of diseases—		
Joints	61	
Muscalar	36	
Other	13	
Massage:		
Hospital patients		32
Outpatients		11
Number of treatments		369
Electric baking:		
Hospital patients		90
Outpatients		15
Number of treatments		1,121
Classification of diseases—		
Joints	100	
Muscular	9	
Other	4	

DENTAL SERVICE. REPORT OF ACTIVITIES.

Total number of sittings		2,472
Oral examinations		746
Caries	182	
Calculus removed	30	
Oral survey, outpatients	49	
Fractured mandible	5	
Impacted teeth	1	
Periodontoclasia	33	
Oral prophylaxis	54	
Examinations in ward	33	
Operative dentistry:		
Anesthesias		165
General	34	
Infiltrative	81	
Conductive	44	
Ethyl chloride	6	
Fillings		180
Amalgam	16	
Amalgam-cement	59	
Cement	86	
Guttapercha	1	
Operative dentistry—Continued:		
Fillings—Continued—		
Porcelain	17	
Root canal	1	
Prosthetic dentistry		6
Roentgenological examinations:		
Complete	212	
Partial	114	
Interpretation	252	
Diseases:		
Abscess, periapical, chronic	381	
Abscess, acute	15	
Cellulitis	2	
Osteomyelitis	2	
Periodontitis	6	
Impacted tooth	1	
Stomatitis, Vincent's	23	
Treatments:		
Gingiva treated	327	
Teeth treated	101	
Teeth extracted	997	
Postoperative treatment	196	

REPORT OF OUT-PATIENT SERVICES.

	Total visits.	New cases.	Pay cases.
Medical service	8,594	2,198	1,826
Surgical service	4,958	1,883	536
Eye, ear, nose, and throat service	14,056	2,164	818
Physiotherapy service	4,519	544	207
X-ray service	1,279	854	208
Totals	33,406	7,643	3,595

COROZAL HOSPITAL.

(Capacity, 600 patients.)

Capt. C. C. ODOM, Medical Corps, U. S. Army, Superintendent.

Purpose.—This institution cares for the insane of the Canal Zone and of the Republic of Panama, being reimbursed for the latter class of patients by the Republic at the fixed rate of $0.75 per day. It also cares for alien employees of the Canal, disabled by reason of injuries or chronic diseases, who desire to enter the institution.

Change of status.—By Executive Order of Novenber 3, 1928, Corozal Hospital was removed from the jurisdiction of Gorgas Hospital.

Repairs and alterations.—The interior of ward "I" was painted by hospital artisans, and the exteriors of wards "K" and "I" were painted and sanded by forces of the constructing quartermaster. Changes and improvements were made in the bathrooms of wards "I" and "J" by hospital artisans.

The following buildings were razed and salvaged by a private contractor: Buildings 526 (boiler shed), 527 (occupational ward), 529 (ward "G"), 530 (sewing room and laundry), 536 (kitchen and dining halls).

The new laundry (building 524) and kitchen and dining halls (building 523) were occupied for the first time on February 21 and March 20, respectively.

The work on the basement of the new concrete female ward (building 521) was completed during the early part of the year, and various activities, including the occupational department, with its work shops and storerooms, the sewing department, the broom factory, and the treatment and dressing rooms were transferred to this basement. The work shop for the general mechanic, formerly located under ward "K," was transferred to the basement of the new concrete kitchen-dining-halls building.

As a result of the new construction and the removal of obsolete buildings, it was necessary to have the hospital grounds graded, covered with good soil and planted with grass, which was done by the municipal engineering division. A concrete road 12 feet wide was laid within the hospital grounds; cement walks were constructed between some of the wards and the new kitchen-dining-halls building; passageways between various buildings were covered; an additional stairway was constructed to female dining room; three lamp posts were erected within the hospital grounds; partitions, shelves and awnings were installed in new buildings; a glavanized iron hood was constructed along the sides and end of the occupational ward; 8 sets of window sashes and copper wire screening were installed in windows and openings over partitions of the operating room and office in the basement of the new hospital ward building, No. 521. An additional 100 feet of 4-inch water line with standpipe was installed between buildings 559 (ward "K"), 534 (ward "A"), and 532 (ward "B") for fire protection. Considerable new equipment purchased during the previous year was installed; also a centrifugal laundry extractor received in April, 1928. Routine painting and repairs to woodwork, plumbing, steam line, etc., have been done by hospital artisans, with the help of patients.

In addition to yams, yucca, sweet potatoes, etc., usually planted each season, 1,200 banana and 400 plantain plants were set out. (For costs of improvements, see letter of transmittal).

Insane patients.—The census on December 31, 1928, was 546, as compared with 544 at the end of the previous year. The number admitted was 266, as compared with 245 for 1927. There were 190 discharges and 71 deaths. There were no suicides or deaths due to violence. Of the 190 discharged, 13 were considered as cured, 113 as improved, 64 as unimproved; 109 of the total released were repatriated. Twelve patients were transferred to Gorgas Hospital for surgical treatment; 8 of these were returned to Corozal (also 1 who remained under treatment December 31, 1927), 3 died, and 1 was discharged from Gorgas Hospital. Of the total admissions, 104 were cases paid for by the Republic of Panama, and the remainder were Canal Zone charity cases or private pay patients.

Other patients.—There were, on December 31, 43 black and 3 white chronically ill or crippled inmates (not insane), as compared with 34 black and 4 white of this class at the beginning of the year. Twenty were admitted, 6 died, and 1 was deported. Sixteen of these patients were transferred to Gorgas Hospital for surgical treatment; 11 were returned to Corozal Hospital (including 2 in Gorgas Hospital December 31, 1927), 2 died, 1 was discharged from Gorgas Hospital; 4 remained under treatment at Gorgas Hospital at the end of the year. All those capable of performing work were encouraged to do so. Twelve were carried on the payrolls, employed as broom and brush makers, bandage rollers, ward attendants, janitors, laborers, and helpers. They manufactured approximately 200 brooms per week and a few hundred scrub and wall brushes during the year.

Recreation.—Weekly picture shows and band concerts have been continued, and the patients appear to derive considerable pleasure from attending these. Picnics were held once a week, during the dry season in a grove back of the hospital, and during the rainy season in the basement of the new ward building; lunches are served, and baseball, handball and other sports are indulged in on these occasions. Church services were held weekly for the Catholic and for the Protestant patients. The former are held in the chapel near the entrance to the hospital road, and the latter in the basement of the new ward building.

Treatment.—Intensive specific treatment was given to patients suffering from syphilitic psychoses. Nine hundred and twenty doses of arsphenamin were administered intravenously, and 277 lumbar punctures were made. At the end of the year there were 87 patients suffering from neuro-syphilis in some form; 60 of these were males and 27 females.

Occupational therapy.—On December 31, 1928, there were 17 male and 36 female patients under treatment in the occupational therapy department. The men are taught carpentry, weaving, bag making, rush-work, etc.; the women are taught to make rugs, and baskets, and to sew, knit, embroider, crochet, and do rush-work. The articles produced and sold were: 138 rugs, 184 bags, 204 ornamental baskets, 146 card-table covers, doilies and other embroidered pieces, 393 raffia purses, 467 pieces of furniture, and 17 boats in bottles.

In addition to the patients engaged in various lines of work in the occupational ward, other male insane who are strong physically, but can not be accommodated in the occupational ward on account of limited space, are sent to the fields and employed in agricultural activities. The value of the produce taken from the patients' garden for hospital consumption amounted to $2,600.53. The more vigorous females are assigned to tasks in the laundry, sewing room, or in the salvage department. As a result of these various undertakings, between 75 and 80 per cent of the patients are engaged in some form of work. All of the laundering, with the exception of bed sheets, pillow cases, and nurses' uniforms, is done by the patients.

The sales from the occupational ward amounted to $2,453.76, and from the brooms and brushes manufactured by the "chronics,"

$4,116.90, a total of $6,570.66. This money is utilized for material required to continue activities in these departments, and for tobacco, confections, fruit, refreshments, etc., for the patients.

Dairy and farm.—Fences were maintained in good state of repair, and the pastures cleared of brush during the dry season.

There were 30 cripples (not insane) employed on the farm at the close, as at the beginning of the year. Two cripples were added, but this increase was offset by the transfer of one to the chronic ward and the repatriation of another. These men are employed in the garden, dairy, piggery, steam plant, cemetery, etc. Five are tending plots of land in the farm reservation which they cultivate as truck gardens, being paid for produce on an actual production basis. Their average earnings per month amounted to $44.80; subsistence is furnished them free of charge. The receipts for produce sold aggregated $3,763.32, and for manure $1,126.58.

Work in connection with structural and mechanical changes in and about the dairy building, started September, 1927, by hospital artisans under the supervision of the foreman mechanic of Gorgas Hospital, has been completed. The former small refrigerating chamber was torn out and replaced by two large cold-storage rooms for cooling the milk produced in the hospital dairy. A new 15 h.p. boiler was set up in the courtyard of the dairy barn and the concrete roof extended over it. This boiler furnishes steam for the new pasteurizer and bottle-washing machine and for the sterilizer. Four steel oil tanks were moved to the side of a hill in the rear of dairy and placed on a concrete platform. These tanks supply fuel by gravity to the two oil-burning boilers through a 4-inch pipe line, and replace two tanks back of ward "D;" the tanks are connected by a 4-inch pipe with the main oil supply line of the Canal. The new pasteurizer and milk cooler, and a bottle filling and capping machine, were permanently set up in the dairy room, which was completely refinished inside, the floor and walls to a height of 6 feet, being of tile. A new 4-ton refrigerating machine was installed and now supplies all the ice required for use of the institution, as well as refrigeration for the milk rooms. (For costs of these alterations, see letter of transmittal, p. 10).

In addition a thorough repair was made of the leaking roof of the dairy barn (building 554-X) by means of a thick layer of "Amiesite;" a road of the same material was laid between the dairy and piggery to replace the old macadam road which was in very bad condition.

In January, 7 cows and 3 calves were purchased from local sources. During the year 13 heifers calved and became milk producers. Eight cows died and 12 were butchered. The herd on December 31 consisted of 81 cows, 15 heifers, 34 calves, and 2 bulls. There were 141,866 quarts of milk produced; sales amounted to $31,201.52. Due to capital investments in connection with alterations and purchases of additional stock and equipment, the dairy showed rather heavy deficits, especially during the first few months of the year, but, with the completion of the construction program and other improvements, it is believed this condition will be reversed.

There were 73 pigs, 17 hogs, and 2 boars on hand December 31. Due to poor breeding results, small number of pigs born and fairly heavy mortality among the sucklings, the piggery showed a deficit of $479.46 during the year, gross income for the period amounting to $1,940.90.

COLON HOSPITAL.

(Capacity, 80 patients).

Major John Wallace, Medical Corps, U. S. Army, Superintendent.

Purpose.—This hospital is operated principally as an emergency hospital on the Atlantic side to care for Panama Canal employees and their families, the Army and Navy personnel and their families, and the passengers and crews of shipping using the Atlantic terminal. All classes of cases are treated here except severe fractures of long bones, communicable diseases, chronics, and children.

Professional work.—There were 2,720 patients admitted to the hospital in 1928, as compared with 2,239 in 1927. There were 21,342 patient days in 1928 as compared with 20,341 in 1927, 18,062 in 1926, and 15,161 in 1925. There were 112 major and 229 minor operations performed, and 602 administrations of salvarsan. Three hundred and eighty-five pregnant women were delivered. The physicians made 272 house or ship visits and 42,138 patients visited the dispensary.

Personnel.—Instead of assigning a physician here temporarily during vacation periods only, one was permanently assigned in October to furnish vacation relief, making a total of seven physicians.

Equipment.—A new operating table was the only new equipment of note that was received.

PALO SECO LEPER COLONY.

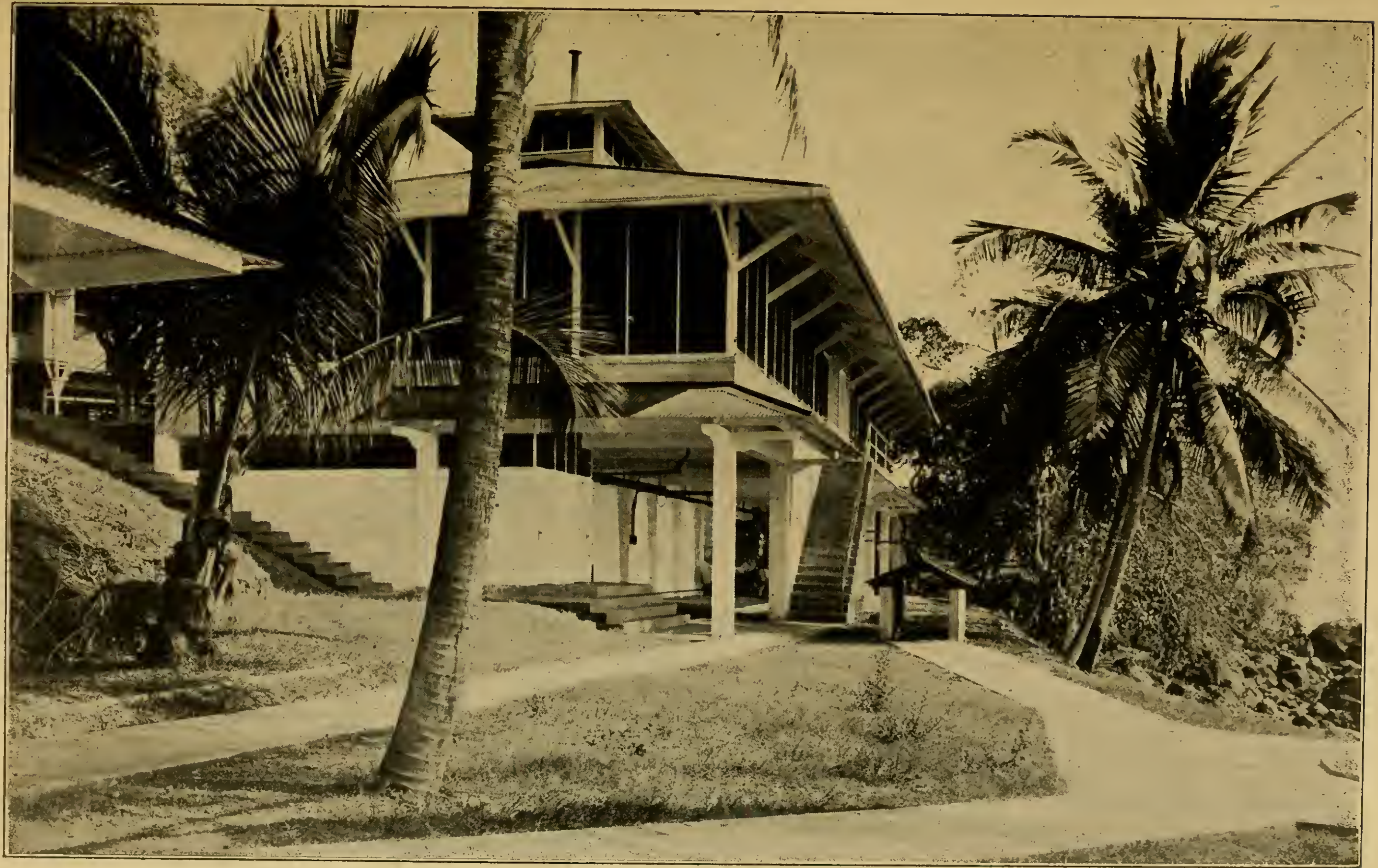
Dr. Ezra Hurwitz, Superintendent.

Census.—There was the same number of patients, 103, in the Colony at the close as at the beginning of the year; 9 patients were admitted to the institution, 7 died and 2 were released on parole. The 7 deaths were recorded as due to leprosy, in accordance with the preference of the *Manual of Joint Causes of Death*, 2d edition, 1925, of the Bureau of the Census. The immediate causes of death as found at autopsy (recorded as "contributory cause") were as shown in the report of the Board of Health Laboratory on page 60.

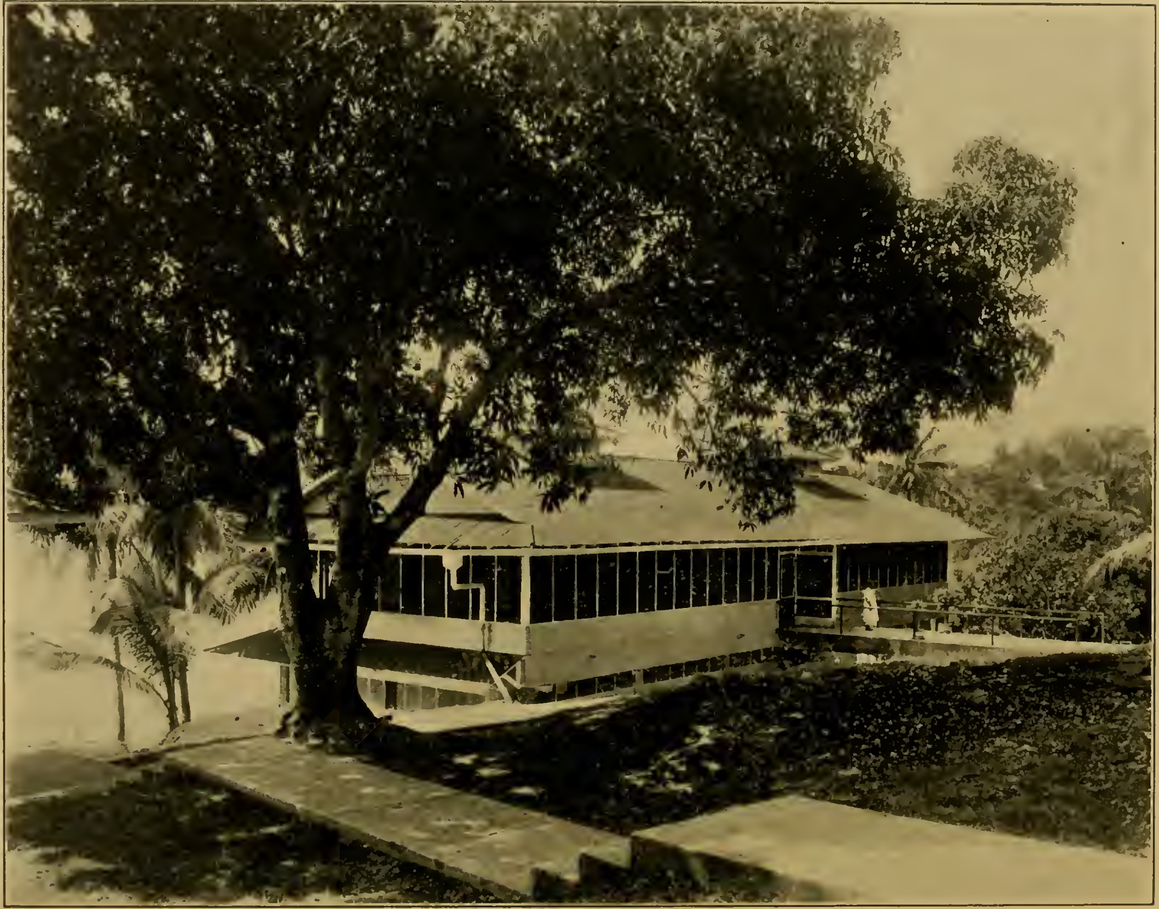
New buildings.—The concrete and frame kitchen-dining-room building, begun in August, 1927, has been completed and is now in use (Cut No. 6.) The dining room has a normal seating capacity for 120 persons without undue crowding. At present about 80 patients eat there regularly, the others being fed in the infirmary or in their own quarters. The patients enter at a side door (reserved for their use alone), take their dishes from a rack, and are served through a window that opens from the kitchen. This window is screened with fine wire mesh at such times as food is not passing through it. From the serving counter the patient carries his food to the table; after eating, he removes his dishes to the sinks at the end of room where they are washed and put away. All the work in this room is done by patients.

The kitchen has a tiled floor; the ceiling slopes upward to a large ventilator high above the center, assuring a comfortable temperature for the workers at all times and ready escape of steam and cooking odors. Cooking is done on 2 army ranges in which oil burners have been installed. A large copper tank furnishes an abundance of hot water. Opening into the kitchen is a 2-chambered refrigerator which is cooled by a 1-ton ammonia compressor in the basement of the building; this compressor in addition makes 300 pounds of ice daily. Connecting with the kitchen on the side opposite the patients' dining room is a mess room for 24 colored employees of the colony, these of course not being lepers. No patients are allowed in the kitchen.

In the basement of the kitchen-dining-room building are 2 toilets for the non-infected employees of the building, a root room, the refrigerating machinery and freezing tanks, and a large area for drying and ironing clothes. Nearly one-half the space beneath the main floor is occupied by a rectangular concrete cistern of 75,000 gallons capacity, which is used for storing rain water collected from the roof of this and the adjoining hospital-office building. The main water supply of the colony is from a shallow well at the rear of the grounds; this furnishes a fairly abundant amount of water which is too highly mineralized for satisfactory use in the boiler or laundry. At the end of the building, on a slightly lower level than the basement in order to permit gravity flow of water from the rain-water cistern, was installed an oil-burning 6-horsepower boiler, 6 slate laundry tubs, an electric washing machine, and a steam clothes-boiler. This latter is an open tank into which the soiled garments and bed linen are placed



Cut No. 6.—Palo Seco Leper Colony. Two story kitchen-dining-room building. Basement concrete and superstructure wood, completely screened. Upper story contains general kitchen, refrigerating and storage rooms, dining room for attendants and dining room for 120 patients. Basement contains laundry, drying room, root cellar, lavatory, refrigerating machinery, and cistern for 75,000 gallons of rain water used in laundering.



CUT NO. 7.—Palo Seco Leper Colony. New dispensary-ward building completed in 1925. Basement of concrete, and superstructure of wood, completely screened. It contains an operating room, a drug room, and two wards above, and offices and storerooms, in the basement.

by the patients themselves; the tank is then nearly filled with water, steam is turned into the heating coils, and the contents are thoroughly boiled before being handled by uninfected employees who complete the washing, drying, and ironing processes. Fuel oil is stored in an underground rectangular concrete tank of 60 barrels capacity, sufficient for 2 to 3 months operation of the laundry and kitchen.

In order to make room for the new kitchen-dining-room building a concrete washing platform and a small shed, long used by the patients for cooking individual meals, were demolished; a new laundry shed with running water and fixed and movable tubs, and a new cook-house with individual braziers, lockers, and tables, were provided in a pleasantly shaded location overlooking the sea. In these places the patients may cook any special dish in their native fashion and to their own taste, and may launder their small bits of finery to suit themselves; they provide for the women folk of the colony a social center almost equal in interest to their former homes and gathering places.

The social side of life in the colony has not been ignored and systematic effort is made to provide interesting recreation for the patients. The former laundry building has had the interior and walls removed, leaving only the roof and cement floor to be used as a band stand. The Palo Seco band, composed entirely of lepers,continues its practice and has from time to time a new instrument added to it through the efforts of Bishop Morris of the American Episcopal Church.

Father Gay, of the Roman Catholic Church, has undertaken to fit out a work and recreation room for the women of the colony. He has secured donations of new sewing machines, comfortable chairs, tables, pictures, books, a phonograph, linoleum, etc., for the furnishing of a large room, 25 feet by 35 feet, in the former office-store-room building. This building has had a toilet, a lavatory, and several new large windows installed, and has been screened and freshly painted.

The old kitchen-dining-room building has been vacated except that the mess hall is still being used for the moving pictures which are shown twice weekly. It is proposed that this building be remodeled into a general recreation center. In it will be placed two pool tables which were given us, the library of Spanish and English books, comfortable chairs, and a second phonograph secured by Father Gay; the latter has also provided a set of billiard balls and cues.

The religous needs of the institution are cared for by Bishop Morris, who conducts Protestant services in the colony chapel each Monday morning, and by Father Gay who has the Roman service on each Wednesday morning. About twice a month on Sunday afternoons a colored Baptist minster holds service in the chapel. A number of other denominations have expressed a desire to have regular services there, but it is believed that the three already mentioned are sufficient for the present needs and that the introduction of too many sects would serve only to complicate matters unduly.

Among other features of interest in the social life of the institution are: The annual Carnival with the election and crowning of the queen and the attendant court functions, quite on a par in gayety with those in the other parts of the country; the annual Christmas dinner under the patronage and with the presence of Bishop Morris; the celebration of other feast days and holidays of the countries represented in the colony, which are fittingly observed; music and dancing, which are a frequent form of entertainment.

As far as possible the inmates of the colony are encouraged to lead normal lives. Work is provided for those who are able-bodied enough to perform such tasks. Much of the gardening, carpentry, masonry, painting, grass cutting, and general work about the institution is done by patients, who are paid for all their services. Some have earned enough by these means to contribute appreciably to the support of their families.

Marriage between lepers is occasionally permitted when age and physical condition are such as to warrant it. On the other hand we have refused to allow marriage when it was obviously not to the best interest of both parties, as when one is too young, or when the disease is in an acute and progressive stage. Married couples have quarters together, made by partitioning off a section of the regular quarters so as to give each couple a private room with screened front and back porch; a toilet and bath room serves each two couples. Such unions at the colony have usually proven happy ones and there has appeared no reason for definitely prohibiting marriages there. Children born of a leprous mother are always removed from her immediately after birth and are placed with relatives of the family or in an institution. But two children of such parents are now known to be alive, one three years of age the other five, both in excellent health.

In May, 1928, a physician was made resident superintendent of the colony in place of the former incumbent who had no medical training. Previously the superintendent had always been a layman; prior to 1921 there had been no physician regularly attached to the colony, and only in cases of fairly grave emergency was one called there. In August, 1921, an attending physician was appointed who devoted only his mornings to work at the colony and his afternoons to maritime quarantine. This arrangement, while far more satisfactory than the previous one, was found not to be entirely adequate for the needs of the institution. At present the physician resides on the colony reservation and is available at all hours, as well as having ample time to devote to administration and treatment.

The intramuscular administration of iodized ethyl esters of chaulmoogra oil continued the principal measure of treatment. Because of the frequent occurrence of muscle degeneration, with abscess formation, the average dose was reduced to 3cc. given semiweekly; the resulting improved tolerance greatly decreased interruptions in treatment.

Ninety-two patients received medication by the intramuscular route; 7 were given crude chaulmoogra oil by mouth, 1cc. in capsules three times daily; 4 patients did not tolerate treatment. Intravenous administration of the ethyl esters was discontinued because it excited a too severe reaction. Of 10 patients who volunteered to take the emulsion of chaulmoogric esters, as recommended by Wayson and Badger (Public Health Reports, Vol. 43, No. 44, November 2, 1928), not one could reach the prescribed dose (6cc. per 100 lbs., daily) without undue gastric disturbance.

In the care of trophic ulcers, dry dressings were found to be more satisfactory than wet. The routine adopted is to wash the ulcer with Dakin's solution, paint it and the margins with 5% aqueous solution of mercurochrome, and cover the whole with a dressing saturated in 75% alcohol.

The addition of fresh whole milk to the dietary seems to have a beneficial effect on the physical well being of the patients.

Bacterioscopic examinations were made on all patients each month. Of 34 patients who have become negative to acid-fast bacilli, 21 have deformities or disabilities which would preclude recommendation for parole or discharge. As far as possible, the more infective cases were quartered separately, but because of limited housing facilities, this could not be carried out as thoroughly as is desirable.

BOARD OF HEALTH LABORATORY.

(Operated in connection with Gorgas Hospital.)

Dr. L. B. Bates, Chief of Laboratory.

Bacillus typhosus.—Recovered in blood culture from 11 individuals and from stools of 7 others. Of the 18 cases, 7 were from Panama, 5 from Colon, 3 from Colombia, 2 direct from ships, and 1 from the Canal Zone. In addition to these there were 4 cases in which *B. paratyphosus B* was recovered from the stool. Three of these latter cases were in Corozal Hospital and 1 was from Panama.

Typhoid carriers.—On December 31, 1927 there were 3 *B. typhosus* carriers under sanitary surveillance, H. B. and G. H. of Panama City, and A. G. of Loma Bracho, Canal Zone. All of these were stool carriers only. Stool specimens from H. B. were examined monthly; all were positive for *B. typhosus*. Several specimens from A. G., who had typhoid fever in the latter part of 1927, were negative. No specimens were obtained from G. H., as he was absent from the city the larger part of the year. There were two *B. typhosus* carriers under sanitary surveillance on December 31, 1928, H. B. and G. H., both of Panama City.

B. paratyphosus B infection in guinea pigs.—Infection with *B. paratyphosus B* was constantly present in the laboratory guinea pigs throughout the year. Efforts to stamp it out were unsuccessful. On several occasions when it appeared to be a thing of the past it was reintroduced by new stock from the United States. Vaccination of an infected lot was tried without success. It is hoped that the local supply will soon be sufficient for our needs.

Reports.—Approximately 52,394 reports, not including duplicates, were made.

BACTERIOLOGICAL PROTOZOAL, AND MISCELLANEOUS EXAMINATIONS.

Blood cultures		255
Positive for *B. typhosus*	13	
Positive for *B. coli*	4	
Positive for *Staphylococcus albus*	2	
Positive for *Staphylococcus albus, hemolytic*	1	
Positive for *Staphylococcus aureus*	23	
Positive for *Streptococcus viridans*	2	
Positive for *Pneumococcus*, not typed	1	
Positive for *Pneumococcus*, Type II	1	
Positive for *Pneumococcus*, Type III	1	
Positive for *Pneumococcus*, Type IV	3	
Stools cultured for typhoid dysentery group		1,059
Positive for *B. typhosus*	25	
Positive for *B. typhosus* (from carriers)	13	
Positive for *B. paratyphosus B*	7	
Positive for *B. dysenteriae*, mannite fermenter group II	12	
Positive for *B. dysenteriae*, mannite fermenter group III	3	
Urines cultured for typhoid group		683
Positive for *B. typhosus*	0	
Urines cultured for organisms other than typhoid group		582
Positive for *B. coli*	152	
Positive for *Staphylococcus albus*	52	
Positive for *Streptococcus viridans*	1	
Positive for *B. pyocyaneus*	5	
Positive for *B. mucosus capsulatus*	5	
Throat cultures for *B. diphtheriae*		2,235
Positive for *B. diphtheriae*	160	
Nazal cultures for *B. diphtheriae*		908
Positive for *B. diphtheriae*	5	
Throat cultures for organisms other than *B. diphtheriae*		4
Spinal fluid cultures		60
Positive for *Meningococcus*	5	
Positive for *B. influenzae*	2	
Positive for *Staphylococcus aureus*, hemolytic	1	
Positive for *Pneumococcus*, Type III	2	
Positive for Pneumococcus, Type IV	1	
Eye cultures		13
Positive for *Staphylococcus aureus*	2	
Positive for *Staphylococcus albus*	3	
Ear cultures		15
Positive for *Streptococcus viridans*	3	
Positive for *Streptococcus*, non-hemolytic	2	
Positive for *Staphylococcus albus*	1	
Positive for *Staphylococcus aureus*	1	
Positive for *Pneumococcus*, Type III	1	

BACTERIOLOGICAL, PROTOZOAL, AND MISCELLANEOUS EXAMINATIONS—Continued.

Mastoid cultures		6
Positive for *Streptococcus viridans*	2	
Positive for *Pneumoccus*, Type III	1	
Nasopharyngeal cultures		21
Sputum cultures		90
Positive for *Pneumococcus*, Type undetermined	8	
Positive for *Pneumococcus*, Type I	6	
Positive for *Pneumococcus*, Type II	3	
Positive for *Pneumococcus*, Type II, atypical	4	
Positive for *Pneumococcus*, Type III	3	
Positive for *Pneumococcus*, Type IV	37	
Positive for *Staphylococcus albus*	4	
Positive for *Streptococcus viridans*	4	
Pleural fluid cultures		27
Positive for *B. influenzae*	1	
Positive for *Staphylococcus aureus*	5	
Ascitic fluid cultures		1
Knee fluid cultures		26
Positive for *Staphylococcus aureus*	2	
Cultures from skin lesions		5
Cultures of pus from various locations		46
Positive for *B. coli*	1	
Positive for *B. welchii*	1	
Positive for *Staphylococcus albus*	1	
Positive for *Staphylococcus albus* and *Streptococcus viridans*	1	
Positive for *Staphylococcus aureus*, hemolytic	2	
Positive for *Staphylococcus aureus*	3	
Positive for *Streptococcus*, non-hemolytic	1	
Culture of gall bladder contents		1
Autopsies cultured		137
Organs, exudates, etc., from above autopsies	213	
Surgical tissues cultured		3
Darkfield examinations		39
Positive for *Treponema pallidum*	3	
Darkfield examintations for yaws		1
Conjunctival smears		69
Positive for Gram negative intracellular diplococcus	15	
Throat smears		85
Positive for fusiform bacillus and spirillum of Vincent's angina	28	
Sputum for *B. tuberculosis*		75
Positive for *B. tuberculosis*	19	
Spinal fluid examined for *B. tuberculosis*		31
Positive for *B. tuberculosis*	6	
Urines for *B. tuberculosis*		14
Positive for *B. tuberculosis*	3	
Urethral smears		31
Positive for Gram negative intracellular diplococci	7	
Vaginal smears		24
Positive for Gram negative intracellular diplococci	8	
Cell count of spinal fluids		13
Leper suspects		17
Positive for *B. leprae*	6	
Lepers for parole		5
Autogenous vaccines prepared		99
Feces for parasites and ova		61
Positive for *Ameba coli*	1	
Positive for *Ameba histolytica*	5	
Positive for *Taenia saginata*	2	
Blood films for malarial parasites		370
Positive for Tertian malarial parasites	82	
Postive for Estivo-autumnal malarial parasites	137	
Positive for mixed parasites	2	
Blood films positive for spirillum of relapsing fever		1
Blood films examined for filaria		3
Red blood corpuscle counts		4
White blood corpuscle counts		4
Differential blood counts		17
Hemoglobin estimations		4
Bile cultures (drainage)		1
Culture of duodenal drainage		2
Culture of material from uterine cavity		2
Water from Balboa Clubhouse swimming pool		300
Water from Army and Navy Y. M. C. A. swimming pool		294
Water from Pedro Miguel swimming pool		153
Water from Corozal swimming pool		11
Water from Fort Amador		133
Water from Fort Clayton		22
Water from Fort Randolph		1
Water from Fort Sherman		19
Water from U. S. A. T. St. Mihiel		1
Water from U. S. S. Trenton		3

BACTERIOLOGICAL, PROTOZOAL, AND MISCELLANEOUS EXAMINATIONS—Continued.

Water from S. S. San Francisco		2
Water from Health Office, Panama		5
Water from Coca Cola ice		3
Foodstuffs examined:		
Ice cream cultured for bacteria count	11	
Milk cultured for bacteria count	286	
Culture of milk, and water supplies (Corozal Dairy)	10	
Culture of apple butter	1	
Culture of canned sweet potatoes	1	
Cultures of food (food poisoning outbreak)	9	
Examination of emergency rations	4	
Soft drinks (Fort Amador) for bacteria count and *B. coli*	43	
Soft drinks (Health Office, Panama) for bacteria count and *B. coli*	42	
Cultures of caustic soda washing fluid, bottling plants	2	
Cultures of bottles, from bottling plaut, soft drinks	2	

SEROLOGICAL EXAMINATIONS.

Wassermann tests		16,946
Kahn tests		1,250
Agglutination tests		101
Positive with *B. typhosus*	21	
Positive with *B. paratyphosus B*	2	
Examination of blood for coagulation time		4
Blood typing for transfusion		53
Blood sera prepared by Swift-Ellis method for intraspinal injection		3

Analysis of Wassermann Reactions.—Sixteen thousand nine hundred and forty-six Wassermann tests were performed on the blood of 12,698 persons. (This includes 823 specimens which were unaccompanied with statistical data.) The results are summarized below:

TABLE SHOWING NUMBER OF PERSONS ON WHOM BLOOD WASSERMANN TESTS WERE MADE AT BOARD OF HEALTH LABORATORY AND RESULTS OF TESTS, 1928.

Race, sex, and status.	Individuals positive.	Individuals negative.	Total individuals tested.	Per cent of individuals positive.
White, civil:				
Males	124	1,949	2,073	5.98
Females	31	662	693	4.47
Children	1	24	25	4.00
Totals	156	2,635	2,791	5.58
White, military, and naval:				
Soldiers, U. S. Army	156	2,651	2,807	5.55
Sailors, U. S. Navy	20	323	343	5.83
Totals	176	2,974	3,150	5.58
Black and mulattoes:				
Males	463	2,593	3,056	15.15
Females	323	2,186	2,509	12.86
Children	25	261	286	8.74
Totals	811	5,040	5,851	13.85
Chinese, males and females	9	74	83	10.84
Grand totals	1,152	10,723	11,875	9.70

In addition, Wassermann tests were made on 719 spinal fluids taken from 665 individuals. One hundred and fifteen specimens from 70 patients (10.52 per cent of the individuals) were positive.

PATHOLOGICAL EXAMINATIONS.

Autopsies.—Four hundred and thirty-six autopsies were performed at the Board of Health Laboratory. The causes of death were as follows:

Epidemic, endemic, and infectious diseases:

Typhoid fever	2
Paratyphoid fever (*B. paratyphosus B*)	1
Malaria fever, estivoautumnal	8
Whooping cough	1
Diphtheria	2
Acute influenzal meningitis	1
Amebic dysentery	2
Bacillary dysentery	1
Leprosy (see table p. 60 following)	7
Erysipelas	1
Meningococcus meningitis	4
Pulmonary tuberculosis	37
Tuberculosis of peritoneum	1
Tuberculosis of dorsal vertebrae	1
Tertiary syphilis	19
Cerebrospinal syphilis	3
Syphilis neonatorum	2
Septicemia (*Staphylococcus aureus*)	1
Septicemia and pyemia (*Staphylococcus aureus*)	1

General diseases not included in the above class:

Epidermoid carcinoma of the esophagus	1
Carcinoma of gall bladder	1
Primary adenocarcinoma of the liver	1
Carcinoma of stomach	4
Adenocarcinoma of the stomach	1
Lymphosarcoma, retroperitoneal lymph nodes	1
Cancer of pelvic peritoneum	1
Carcinoma of cervix	3
Carcinomatosis, peritoneal	1
Carcinoma of breast	2
Endothelioma of lymph nodes	1
Carcinoma of antrum of Highmore, left	1
Fibrosarcoma left leg	1
Obstructing leiomyoma trigone of the bladder	1
Acute rheumatic carditis	1
Pellagra	7
Diabetes mellitus	4
Spontaneous rupture of spleen	1
Myelogenous leukemia	1
Hodgkin's disease	1
Acute ethyl alcohol poisoning	1
Hemorrhagic disease of newborn	2
Purpura hemorrhagica	1
Total	134

Diseases of the nervous system and of the organs of special sense:

Abscess of brain	2
Acute streptococcic meningitis	1
Acute pneumococcic meningitis	1
Acute suppurative meningitis	2
Pachymeningitis, hemorrhagica interna	2
Chronic leptomeningitis	1
Locomotor ataxia	1
Lateral sclerosis	1
Hemorrhage, epidural	1
Cerebral hemorrhage	5
Meningeal hemorrhage	3
Hemorrhage of the pons	1
Thrombosis, right internal striate artery	1
Thrombosis, right middle cerebral artery	1
General paralysis of the insane	22
Dementia precox	2
Manic depressive psychosis	1
Epilepsy	1
Softening of brain	7
Idiocy	1
Chronic suppurative otitis media	2
Total	59

Diseases of the circulatory system:

Subacute bacterial endocarditis	3
Acute toxic myocarditis	3
Myocardial softening	1
Fibrosis of heart	1
Hypertrophy and dilatation of heart	2
Hypertensive heart disease	1
Infarction of the myocardium	1
Chronic myocarditis	1
Aortic aneurysm	2
Arteriosclerosis, general	2
Coronary sclerosis	2
Coronary thrombosis	1
Thrombosis superior mesenteric artery	1
Total	21

Diseases of the respiratory system:

Abscess of nose (*Staphylococcus aureus*)	1
Suppurative ethmoiditis	1
Pansinusitis, acute, suppurative	1
Bronchopneumonia	23
Lobar pneumonia	22
Empyema	2
Bronchial asthma	1
Total	51

Diseases of the digestive system:

Ludwig's angina	1
Gastric ulcer	4
Gastric and jejunal ulcers	1
Duodenal ulcer	1
Ruptured duodenal ulcer	1
Acute enteritis	2
Enterocolitis, acute	8
Acute ulcerative colitis	1
Uncinariasis	1
Acute suppurative appendicitis	1
Acute gangrenous appendicitis	3
Chronic suppurative appendicitis	1
Strangulated inguinal hernia	2
Prolapsed rectum	1
Acute yellow atrophy of liver	1
Cirrhosis of liver	2
Cholelithiasis	1
Total	32

Nonvenereal diseases of the genito-urinary system and annexa:

Acute nephritis	2
Chronic nephritis	20
Acute suppurative pyelonephritis	1
Pyonephrosis	1
Acute suppurative pyelitis	1
Hydronephrosis, bilateral severe	1
Chronic suppurative prostatitis	1
Chronic prostatitis with hypertrophy	1
Chronic suppurative salpingitis	1
Total	29

The puerperal state:

Acute diffuse peritonitis	1
Total	1

Diseases of the skin and of the cellular tissue:

Gangrenous stomatitis	1
Cellulitis of scalp	1
Acute gangrenous cellulitis of perineum and scrotum	1
Acute suppurative cellulitis, right arm	1

Diseases of the skin and of the cellular tissue—Continued:	
Abscess leg (*Staphylococcus aureus*)	1
Phlegmonous cellulitis, forehead	1
Cellulitis of the face (*Streptococcus viridans*)	1
Total	7
Diseases of the bones and of the organs of locomotion:	
Chronic osteomyelitis of cervical and dorsal vertebrae	1
Osteomyelitis, left tibia	1
Osteomyelitis, left mandible	1
Osteomyelitis, multiple	1
Total	4
Malformations:	
Congenital hydrocephalus	2
Congenital malformation of heart	1
Congenital malformation of brain and skull	2
Congenital malformation of duodenum	1
Total	6
Diseases of early infancy:	
Malnutrition	5
Marasmus	1
Premature birth	7
Injury at birth	3
Hemorrhage, multiple, lungs, cause undetermined	1
Total	17
Affections produced by external causes:	
Suicide by poisoning, cyanide	1
Suicide by poisoning, morphine	1
Suicide by hanging	1
Suicide by firearms	3
Suicide by knife wound, neck	1
Suicide by knife wound, right lung	1
Suicide by jumping from high place	1
Reaction to non-specific protein therapy, (triple typhoid vaccine given intravenously)	1
Affections produced by external causes—Contd.:	
Acute, accidental phosphorus poisoning	3
Burns, multiple, accidental, gasoline	1
Ethylene anesthesia for dilatation of stricture	1
Ether anesthesia	1
Accidental drowning	3
Accidental gunshot wounds (multiple)	1
Accidental fall on sidewalk	1
Accidental fall into hold of ship	1
Accidental fall from building	1
Accidental fall from dock	1
Other accidental falls	2
Accidental traumatism by broken cable on electric towing locomotive	1
Accidental traumatism by railroad	3
Accidental traumatism by automobile	2
Accidental traumatism by fall from automobile	1
Traumatism by wagon	2
Accidental traumatism by animal (dragged and kicked by mule)	1
Accidental gunshot wounds of head	1
Gunshot wound of abdomen (homicidal)	1
Gunshot wound of heart (homicidal)	1
Foreign body (bone) impacted in esophagus	1
Total	40
Ill-defined diseases:	
Undetermined	3
Infection of undetermined origin	5
Total	8
Appendix:	
Stillbirth, accident of pregnancy	3
Stillbirth, accident of labor	3
Stillbirth, induced premature labor (hydramnios)	1
Stillbirth, cause undetermined	20
Total	27
Grand total	436

THE MORE FREQUENT CAUSES OF DEATH FOUND AT AUTOPSY IN BOARD OF HEALTH LABORATORY, 1928.

Cause of death.	Cases.	Per cent of autopsies.
Syphilis (including general paresis)	46	10.55
Pneumonia (broncho and lobar)	45	10.32
External causes	40	9.17
Tuberculosis	40	9.17
Bright's disease (acute and chronic nephritis)	22	5.04
Cancer	19	4.35
Organic heart disease	13	2.98
Cerebral hemorrhage	10	2.29

THE MORE FREQUENT CAUSES OF DEATH FOUND AT AUTOPSY IN BOARD OF HEALTH LABORATORY, 1904 TO 1928.

Year.	Number of autopsies per year.	Pneumonia.	Tuberculosis.	Hemoglobinuric fever and malaria.	Affections produced by external causes.	Chronic nephritis.	Combined types of dysentery.	Organic heart disease.	Typhoid fever.	Diarrhea and enteritis (in children).	Cancer.	Syphilis, including general paralysis.
1904....	6	1	1	....	....	....	....	....	....	....	....	....
1905....	269	60	9	27	3	8	5	3	9	....	2	....
1906....	509	191	22	50	24	23	39	15	33	....	2	....
1907....	496	156	35	27	40	27	36	12	58	4	4	1
1908....	361	59	63	46	26	25	23	11	14	....	7	2
1909....	295	55	37	26	32	31	11	17	11	1	5	....
1910....	451	50	91	52	30	37	36	16	10	6	4	1
1911....	508	83	102	41	38	36	19	20	9	11	11	....
1912....	425	53	79	23	37	27	15	22	6	7	11	2
1913....	460	47	89	21	34	26	8	26	5	23	12	11
1914....	375	36	78	6	38	12	6	27	5	14	3	5
1915....	328	28	56	14	20	12	5	14	2	15	10	9
1916....	323	25	81	8	17	20	7	10	6	9	7	15
1917....	330	24	51	5	21	23	3	18	1	3	5	12
1918....	253	38	68	6	6	12	....	8	....	1	5	5
1919....	324	22	55	3	15	14	3	20	3	10	11	8
1920....	334	[1]46	55	....	29	11	5	16	....	....	6	15
1921....	289	14	37	4	16	5	8	17	2	4	7	20
1922....	262	14	29	5	19	9	4	9	3	6	10	14
1923....	205	6	17	3	9	9	5	12	2	1	11	14
1924....	263	14	33	3	29	10	4	21	1	3	13	12
1925....	306	15	34	7	38	11	3	18	1	3	16	17
1926....	282	14	32	5	32	9	2	11	....	5	13	25
1927....	358	27	22	10	35	17	3	19	2	1	21	23
1928....	436	45	40	8	40	20	3	13	2	10	19	46
Totals.	8,448	1,123	1,216	400	628	434	253	375	185	137	215	257

[1] This includes 32 cases of influenza.

NUMBER OF AUTOPSIES PERFORMED REVEALING THE FOLLOWING DISEASES PER YEAR AT BOARD OF HEALTH LABORATORY, 1904 TO 1928.

Year.	Autopsies performed per year.	Yellow fever.	Beriberi.	Anklyostomiasis.	Tetanus.	Infectious diseases of children.	Palgue.	Smallpox.
1904...........................	6	....	....	....	....	....	....	....
1905...........................	269	12	7	7	2	....	1	....
1906...........................	509	[1]1	5	4	....	....	....	....
1907...........................	496	....	1	2	1	....	....	....
1908...........................	361	....	1	2	3	....	....	....
1909...........................	295	[1]2	....	....	....	....	[2]1	....
1910...........................	451	[1]2	....	....	....	....	....	....
1911...........................	508	....	1	1	1	....	[2]1	....
1912...........................	425	[1]1	....	....	1	4	....	....
1913...........................	460	....	....	2	3	1	....	....
1914...........................	375	....	1	....	4	2	....	....
1915...........................	328	[1]3	1	....	2	1	....	....
1916...........................	323	....	2	....	....	3	....	1
1917...........................	330	....	7	....	1	2	....	....
1918...........................	253	....	....	2	....	3	....	....
1919...........................	324	[1]2	....	....	....	3	....	....
1920...........................	334	....	....	....	....	1	....	....
1921...........................	289	....	....	....	....	2	....	2
1922...........................	262	....	....	....	1	3	....	....
1923...........................	205	....	....	....	1	....	....	....
1924...........................	263	....	....	....	....	2	....	....
1925...........................	306	....	....	....	....	3	....	....
1926...........................	282	....	....	....	1	1	....	....
1927...........................	358	....	....	....	....	....	....	....
1928...........................	436	....	....	....	....	....	....	....
Tota's...........................	8,448	[1]23	26	20	21	31	[2]3	3

[1] All cases since 1906 were imported cases. [2] All cases since 1905 were imported eases.

Per cent autopsied.—Five hundred and sixty-five bodies (not including 2 disinterred and 5 for storage) passed through the laboratory; 436 or 77.16 per cent were autopsied.

Malaria carriers found at autopsy	0
Syphilis found at autopsy (cases)	62
Glycosuria found at autopsy (cases)	1
Ameba carrier found at autopsy	1
Bacillary dysentery found at autopsy	1

Intestinal parasites found at autopsy.—Twenty-six cases in 436 autopsies performed at the laboratory, or 5.95 per cent, showed one or more parasites or their ova, as follows:

Ascaris	7
Uncinaria	6
Hookworm	1
Trichuris	2
Strongyloides	3

Multiple infections occurred as follows:

Ascaris and uncinaria	4
Ascaris, uncinaria, trichuris	1
Trichuris and ascaris	1
Trichuris and uncinaria	1

CAUSES OF DEATH FOUND AT AUTOPSY OF LEPERS IN BOARD OF HEALTH LABORATORY, 1928.

Autopsy No.	Cause of death.	Contributory Cause.
8037	Leprosy	Pulmonary tuberculosis.
8170	Leprosy	Acute ulcerative endocarditis (*Streptococcus hemolyticus*).
8188	Leprosy	Estivo autumnal malaria.
8202	Leprosy	Carcinoma of stomach and liver.
8363	Leprosy	Pulmonary tuberculosis.
8390	Leprosy	Chronic valvular heart disease.
8397	Leprosy	Cerebral hemorrhage.

MICROSCOPIC EXAMINATIONS AND REPORTS ON SURGICAL SPECIMENS.

Conjunctiva	1
Eye, enucleated	4
Eyelid	2
Eye, section from sclera	1
Ear (pinna and adjacent nodes)	1
Nose, specimen from	4
Lip, specimen from	2
Mouth, specimen from	8
Tongue, section from	4
Bartholin cyst	1
Cyst of jaw	1
Parotid gland, tumor of	1
Tonsils, pairs	5
Tonsils and adenoids	4
Larynx, tumor of	3
Neck, specimen from	8
Thyroid gland, or part thereof	17
Breast, specimen from	15
Breast, amputated	10
Peritoneum, specimen from	4
Omentum, section from	1
Liver, specimen from	1
Gall bladder	22
Spleen	2
Kidney	1
Urethra, partial resection of	1
Prostate	5
Penis, tissue from foreskin	2
Testis, excised	3
Testis and spermatic cord	1
Epididymis	1
Spermatic cord and epididymis excised	1
Uterus	12
Uterus and adnexa	62
Uterus, adnexa and appendices	68
Uterus, adnexa, appendix, and excised lipoma	1
Uterus, specimens from (including curettings)	8
Uterine cervix or specimens from	24
Uterine contents (fetus and placenta)	31
Tubes	5
Tube or tubes with ovary or ovaries	4
Tube or tubes, ovary or ovaries and appendix	17
Tube and appendix	2
Ovary	2
Ovary and appendix	3
Ovary, biopsy posterior wall uterus, uterine curettings	1
Ovarian cyst and gall bladder	1
Vagina, specimen from	5
Vulva, section from	1
Duodenal ulcer	5
Appendix	238
Appendix and gangrenous appendices epiploicae	1
Appendix and fibroid tumor	1
Stomach, specimen from	5
Cecum	1
Small intestine, biopsy	1
Rectum, specimen from	8
Anus, specimen from	2
Anus, fistula of	5
Arm, tissue from	2
Arm, amputated	2
Wrist, excised tumor from	1
Lower extremities	4
Leg, tumor of	2
Skin and subcutaneous tissues	44
Bones	8
Tendon, specimen from	1
Joint, specimen from	2
Lymph nodes, excised	20
Ascitic fluid for tumor cells	2
Toe, tissue from	2
Abdominal wall, tumor from	1
Fluid from abdomen	1
Tissue (source not stated)	2
Autopsy tissues from Colon Hospital (33 tissues) sets	15
Total	760

Lesions in surgical specimens.—The principal lesions encountered in surgical specimens, other than inflammatory, were as follows:

Malignant tumors (cancer):	
Nose	2
Eyelid	1
Ear	1
Lip	2
Mouth	1
Tongue	1
Gum	1
Parotid gland	1
Tonsil	1
Larynx	1
Postpharyngeal wall	1
Neck	2
Thyroid	1
Breast	5
Peritoneum	1
Liver	1
Prostate	3
Testis	1
Uterus	2
Cervix	17
Ovary	1
Stomach	1
Sigmoid	1
Abdominal wall	1
Leg	1
Face	2
Periosteal fibrosarcoma	1
Femur	1
Cervical lymph glands	4
Iliac, inguinal and femoral glands	1
Sediment from ascitic fluid	1
Endometriosis	2
Dermoid	1
Tumor, origin undetermined	1
Total	65

Benign tumors:	
Nasal polypi	2
Fibroma, buccal mucous membrane	1
Hemangioma of tongue	1
Mixed tumor of jaw	1
Papilloma of larynx	2
Adenomatous goiter	3
Fibroadenoma of breast	7
Intracanalicular fibroma of breast	1
Myomata of uterus	67
Dermoid cyst, ovary	1
Teratoma of ovary, benign	1
Adenoma of prostate	1
Polyp of stomach	1
Cellular nevus of skin	1
Lymphangioma of skin	1
Hemangioma of skin	1
Fibroma of tendon sheath (wrist)	1
Hydatidiform mole	1
Nevus of face	1
Lymphangioma, face	1
Fibroma of periosteum	1
Osteoma, first metacarpal bone, right	1
Adenoma of sweat glands	1
Lipoma, leg	1
Dermoid cyst, buttock	1
Exostosis	1
Fibroma	7
Lipoma	6
Osteoma, origin not stated	1
Papilloma	6
Molluscum contagiosum	1
Epithelial cysts	5
Total	128

Specimens showing tuberculosis:	
Tonsils, pairs	2
Fallopian tube	1
Tendon sheath (ganglion)	1
Carpal bones	1
Sinus	1
Rib	1
Epididymis	1
Gland	1
Axillary adenitis	1
Cervical lymph nodes	1
Skin and subcutaneous tissues	1
Tuberculous peritonitis	1
Total	13

Miscellaneous human examinations:	
Placentae	410

WILD AND DOMESTIC ANIMALS.

Bacteriological:		
Culture of Guinea pigs' spleens		549
Positive for *B. paratyphosus B*	465	
Culture of rabbit spleens		14
Culture of rat spleens		2
Blood specimens from cattle		5
Positive agglutination with *B. abortus*	3	
Blood film from cow		12
Positive for *Piroplasma*	1	
Blood film from horses and mules		368
Positive for filaria embryos	1	
Positive for *Piroplasma*	6	
Positive for *Piroplasma caballi*	2	
Positive for *Trypanosoma hippicum*	7	
Specimens from dog (autopsy)		2
Agglutination tests (blood from dogs)		8
Total		960

Autopsies:	
Guinea pigs	540
Rabbits	44
Total	584

Histological examinations:	
Cows, autopsy tissues from	11
Positive for *B. tuberculosis*	3
Horse, autopsy tissues from	1
Mule, specimen from (tumor)	1
Steer, specimens from	1
Total	14

Rats examined:	
Mus musculus	3,569
Mus alexandrinus	77
Mus norwegicus	490
Mus rattus	2,943
Total	7,079

MICROSCOPIC SLIDES PREPARED.

Surgical preparations (8 frozen)	5,078
Autopsy preparations (25 frozen)	3,584
Animal preparations	171
Total	8,833

PHOTOGRAPHS.

Of lepers (taken at Palo Seco by Dr. Philip Horwitz)	6

CHEMICAL ANALYSES AND EXAMINATIONS.

Bay rum		1
Beverages		57
Soda water, saccharine determinations	51	
Soda water, salicylic acid determinations	4	
Whisky	2	
Bleaching powder		10
Blood		2,735
Non-protein nitrogen determinations	2,186	
Urea nitrogen determinations	173	
Uric acid determinations	339	
Creatinin determinations	792	
Glucose determinations	2,539	
Ammonia determinations	2	
Calcium determinations	17	
Carbon dioxide determinations	17	
Sodium chloride determinations	29	
Alcohol determinations	1	
Icterus index	116	
Van den Bergh test	16	
Caustic soda solutions		17
Candles, wax determination		3
Calculus, biliary		1
Calculus, urinary		2
Calibration of sphygmomanometers		3
Capsules, atropine		1
Coloring matter, rum		1
Drugs and chemicals		15
Carbolic acid, crude	5	
Cattle dip, arsenical	1	
Disinfectant, hide	5	
Neoarsphenamine	4	
Electrolyte		2
"Freebowl" cleaning compound		1
"Freedrain" cleaning compound		1
Foodstuffs		258
Butter	1	
Food, preservatives	9	
Ice cream	51	
Milk, condensed	3	
Milk, dairy	153	
Milk, fermillac	1	
Milk, mothers	37	
Oleomargarine	2	
Syrup, coloring matter	1	
Gasoline strainer		1
Gastric contents		742
Soap		1
Sodium carbonate		43
Stomach contents, iodides		1
Stools		2
Lead (negative)	1	
Occult blood (negative)	1	
Succinchlorimide		1
Spinal fluids		667
Colloidal gold test	564	
Ammonium sulphate tests	556	
Phenol tests	554	
Glucose determinations	4	
Substances for identification		9
Cocaine	2	
Cocaine hydrochloride	1	
Mineral for potassium	1	
Tablets for morphine	2	
Quinine sulphate tablets	1	
Sodium benzoate	1	
Toxicological		15
Banana (negative for phosphorus)	1	
Blood, alcohol determination	1	
Brain (morphine negative, alcohol positive)	1	
Chicken (positive for phosphorus)	1	
Gastric contents (negative for phenol)	1	
Intestinal contents (positive for phosphorus)	2	
Kidney (morphine negative)	1	
Liver (negative for phosphorus)	1	
Rice (negative for phosphorus)	1	
Stomach contents (positive for cyanides)	1	
Sotmach contents (negative for morphine)	1	
Stomach contents (negative for strychnine and other alkaloids)	1	

Toxicological—Continued:		
Stomach washings (positive for morphine)	1	
Sugar cane (negative for phosphorus)	1	
Urine (negative for morphine)	1	
Urine		119
Glucose determinations	16	
Lead determinations	12	
Quinine determinations	12	
Routine analyses	73	
Urea determinations	1	
Uric acid determinations	3	
Urobilin determinations	1	
Veronal	1	
Vomitus, occult blood		1
Water, chlorides		10
Water, mineral analysis		1
Wash water, alkalinity		1
Hydnocarpic esters prepared, liters		20
Alcohol recovered, gallons		89
Aniline recovered, liters		5¾

UNDERTAKING DEPARTMENT.

Bodies received (2 disinterred)	572
Bodies embalmed	87
Bodies cremated (1 disinterred)	168
Bodies buried on Isthmus	358
Bodies shipped from Isthmus (1 disinterred)	49

GENERAL TABLES.

TABLE I.—DISCHARGES FROM HOSPITALS, DEATHS, AND NONEFFECTIVE RATES FOR EMPLOYEES.

ABSOLUTE NUMBERS.

	Average number of employees.	Discharges from and deaths in hospital.			Total deaths.			Days treatment in hospitals and quarters.	Average number sick per day in hospitals and quarters.
		Total.	Disease.	External causes.	Total.	Disease.	External causes.		
Year 1928:									
White	3,308	872	795	77	21	19	2	20,985	57.34
Black	10,952	1,648	1,407	241	121	112	9	55,519	151.69
Totals	14,260	2,520	2,202	318	142	131	11	76,504	209.03
Year 1927:									
White	3,197	734	668	66	25	19	6	17,959	49.20
Black	10,364	1,248	989	259	97	87	10	50,393	138.05
Totals	13,561	1,982	1,657	325	122	106	16	68,352	187.25

ANNUAL RATE PER 1,000 EMPLOYEES.

	Average number of employees.	Discharges from and deaths in hospital.			Total deaths.			Days treatment in hospitals and quarters.	Average number sick per day in hospitals and quarters.
		Total.	Disease.	External causes.	Total.	Disease.	External causes.		
Year 1928:									
White	....	263.60	240.33	23.27	6.35	5.74	.61	....	17.33
Black	....	150.47	128.47	22.00	11.05	10.23	.82	....	13.85
Totals	....	176.72	154.42	22.30	9.96	9.19	.77	....	14.66
Year 1927:									
White	....	229.50	208.95	20.64	7.82	5.94	1.88	....	15.39
Black	....	120.42	95.42	24.99	9.36	8.39	.96	....	13.32
Totals	....	146.15	122.19	23.97	9.00	7.82	1.18	....	13.81

Table II.—CAUSES OF DEATHS OF EMPLOYEES ARRANGED WITH REFERENCE TO COLOR, AGE, AND LENGTH OF RESIDENCE ON ISTHMUS, 1928.

	Total deaths.	Color.		Age (in years).											Length of residence on Isthmus (in years).											
		White.	Black.	15–20	21–25	26–30	31–35	36–40	41–45	46–50	51–55	56–65	66–75	Unknown.	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–10	10–15	Over 15	Life.	Unknown.
Tuberculosis of the respiratory system	12	1	11				2	5	1		3	1										1		6		5
Tertiary syphilis	14		14			2	2	2	1	4	2	1				1							1	7		5
Other forms of syphilis	1		1								1															1
Septicemia	1		1						1																	1
Cancer of the larynx	1	1										1												1		
Cancer and other malignant tumors of the stomach and liver	3	1	2								1	2										1	1			1
Cancer and other malignant tumors of peritoneum, intestines and rectum	3	3						1		1		1												3		
Cancer and other malignant tumors of other or unspecified organs	3	1	2						1	2														2		1
Obstruction of bladder	1		1							1														1		
Diabetes mellitus	1	1											1													1
Leukemia	2	1	1					1			1											1				1
Simple meningitis	1		1							1														1		
Cerebral hemorrhage	10	1	9				1	3	1	3	2												1	5		4
Cerebral embolism and thrombosis	2		2									1	1											1		1
Hemiplegia	1		1							1														1		
Sclerosis	1		1						1																	1
General paralysis of the insane	5		5			1	1	1	1	1													2	1		2
Epilepsy	2		2					1			1													2		
Acute endocarditis	1		1					1																1		
Organic diseases of the heart	11		11					1	4	2	2	2							1				1	3	1	5
Aneurysm	5		5				1	2	1	1											1		1	2		1
Arteriosclerosis	2	1	1								1		1											2		
Other diseases of arteries	2		2							1	1													1		1
Embolism and thrombosis (not cerebral)	1	1								1																1
Pansinusitis, acute	1		1	1																					1	
Chronic bronchitis	1		1					1																1		
Lobar pneumonia	17	1	16		1	2	2	7	2	2			1											5	3	9
Ulcer of stomach	5	1	4					3		1			1		1									1		3
Ulcer of duodenum	1		1					1																		1
Acute appendicitis	1	1								1														1		
Hernia	2		2						2																	2
Perforation of jejunum	1		1					1																		1
Chronic nephritis	11	1	10			1	3	1	1	3		1	1					1					1	1	1	7
Stricture of urethra	1	1									1													1		
Chronic prostatitis	2		2				1				1													1	1	
Ectopic gestation	1	1				1													1							
Acute abscess	1	1										1												1		
Suicide, morphine poisoning	1	1											1											1		
Suicide by firearms	1		1			1																			1	
Accidental poisoning	1		1							1													1			
Accidental drowning	2		2					2																		2
Accidental traumatism by fall	3	1	2			2				1									1					1	1	
Automobile accident	2		2	1		1																		1		1
Injury by truck	1		1					1																		1
Totals	142	21	121	2	1	11	13	35	17	28	17	11	7	....	1	1	....	1	3	....	1	3	9	55	9	59

TABLE III.—DEATHS AND DEATH RATES OF RESIDENTS OF THE CANAL ZONE AND THE CITIES OF PANAMA AND COLON.

Place.	Population.	Deaths.			Annual rate per 1,000 population.		
		Total.	Disease.	External causes.	Total.	Disease.	External causes.
Year 1928:							
Panama	59,818	1,434	1,390	44	23.97	23.23	.74
Colon	32,000	442	426	16	13.81	13.31	.50
Canal Zone	37,056	316	273	43	8.53	7.37	1.16
Totals	128,874	2,192	2,089	103	17.01	16.21	.80
Year 1927:							
Panama	59,635	1,248	1,201	47	20.93	20.14	.79
Colon	31,583	423	404	19	13.39	12.79	.60
Canal Zone	36,794	298	265	33	8.10	7.20	.90
Totals	128,012	1,969	1,870	99	15.38	14.61	.77

Table IV.—DEATHS OF RESIDENTS OF THE CANAL ZONE AND THE CITIES OF PANAMA AND COLON, BY CAUSE, SEX, COLOR, AGE, AND PLACE OF RESIDENCE, 1928.

Cause of death.	Total deaths.	Sex.		Color.			Age (in years).											Place of residence.		
		M.	F.	W.	B.	Y.	Under 1 year.	1-4	5-10	11-20	21-30	31-40	41-50	51-60	61-75	76-100	Age unknown	Panama.	Colon.	Canal Zone.
Epidemic, endemic, and infectious diseases																				
Typhoid fever	4	2	2		4				1	2	1							3	1	
Paratyphoid fever	1		1		1									1					1	
Malaria, estivoautumnal	12	8	4	4	8			5	2	1	2	1		1				4	1	7
Malaria, tertian	1	1			1								1						1	
Malaria, type undetermined	1	1			1										1			1		
Malaria, clinical	2		2		2		2											2		
Hemoglobinuria, malarial	1	1			1			1											1	
Smallpox	0																			
Measles	1		1		1			1										1		
Whooping cough	3		3	1	2			3										2	1	
Diphtheria	8	3	5	3	5		2	5	1									7	1	
Influenza with pulmonary complications specified	6	2	4	1	5			2		1		1				2		3	3	
Influenza without pulmonary complications specified.	2	1	1	1	1						2							2		
Dysentery, amebic	6	4	2		6						1	4		1				5	1	
Dysentery, bacillary	1		1		1								1							1
Plague	0																			
Yellow fever	0																			
Leprosy	5	4	1	1	4						2			2	1			1	1	3
Erysipelas	5	1	4	1	4						1	1	1	1	1			3	1	1
Meningococcus meningitis	5	5		3	2				2	2	1							2		3
Anthrax	1	1			1						1								1	
Tetanus	3	2	1		3		1	1				1						3		
Tuberculosis of the respiratory system	291	152	139	20	265	6	4	8	4	50	73	66	52	24	7	1	2	208	59	24
Tuberculosis of the meninges and central nervous system	11	5	6	1	9	1	1	5	3		2							9	2	
Tuberculosis of the intestines and peritoneum	6	3	3	1	5			1		2	1	1			1			5		1
Tuberculosis of the vertebral column	2	1	1		2			2										2		
Tuberculosis of the bones (vertebral column excepted)	2	1	1		2		1					1						1	1	
Acute disseminated tuberculosis	2	1	1		2		1				1								1	1
Chronic or unspecified disseminated tuberculosis	2	1	1		2			1	1									2		
Primary syphilis	1	1			1										1			1		
Secondary syphilis	1		1		1								1					1		
Tertiary syphilis	38	30	8	1	35	2				1	5	9	14	6	3			18	10	10
Cerebrospinal syphilis	2	1	1		2					1			1					1	1	
Hereditary syphilis	6	4	2	1	5		4	1					1					3	2	1
Other forms of syphilis	29	24	5	2	27					2	1	10	8	3	4	1		24	5	
Pyemia and septicemia	3	2	1	1	2			1			1			1				1	1	1
Septicemia	7	4	3		6	1	2	1		2			1	1				3	2	2
General diseases not included in the above class.																				
Cancer and other malignant tumors of the buccal cavity	3	3		1	2							1		1	1			2	1	
Cancer and other malignant tumors of the stomach and liver	26	15	11	4	21	1						3	6	5	12			14	8	4

Cancer and other malignant tumors of the peritoneum, intestines and rectum	6	4	2	3	3	......	......	......	......	......	......	2	2	2	......	......	......	2	1	3
Cancer and other malignant tumors of the female genital organs	25	0	25	4	21	......	......	......	......	......	4	3	8	5	5	......	......	13	9	3
Cancer and other malignant tumors of the breast	4	......	4	1	3	......	......	......	......	......	......	1	1	1	......	1	......	2	2	......
Cancer and other malignant tumors of other or unspecified organs	21	14	7	9	12	......	......	......	......	......	......	3	5	10	3	......	......	11	4	6
Benign tumors and tumors not returned as malignant	1	1	......	......	1	......	......	......	......	......	......	......	1	......	......	......	......	......	1	......
Acute rheumatic fever	2	......	2	......	2	......	......	......	2	......	......	......	......	......	......	......	......	1	1	......
Chronic rheumatism, osteoarthritis, gout	3	......	3	......	3	......	......	......	......	......	2	......	......	......	1	......	......	3	......	......
Pellagra	19	3	16	1	18	......	......	......	......	1	3	7	4	2	1	......	1	9	8	2
Beriberi	2	2	......	......	2	......	......	......	......	1	......	......	......	......	......	......	1	2	......	......
Diabetes mellitus	9	5	4	3	6	......	1	1	......	......	......	......	2	3	2	......	......	3	2	4
Exophthalmic goiter	1	......	1	1	......	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......
Diseases of the thymus gland	5	4	1	......	4	1	4	1	......	......	......	......	......	......	......	......	......	5	......	......
Diseases of the spleen	1	1	......	1	......	......	......	......	......	1	......	......	......	......	......	......	......	......	......	1
Leukemia	3	3	......	2	1	......	......	1	......	......	......	1	......	1	......	......	......	2	......	1
Hodgkin's disease	1	1	......	......	1	......	......	......	......	......	......	1	......	......	......	......	......	......	......	1
Acute alcoholism	2	2	......	1	1	......	......	......	......	......	1	1	......	......	......	......	......	1	......	1
Other general diseases	15	10	5	1	14	......	13	......	......	1	......	1	......	......	......	......	......	7	4	4
Diseases of the nervous system and of the organs of special sense.																				
Encephalitis	1	1	......	......	1	......	......	......	......	......	......	......	......	......	1	......	......	1	......	......
Simple meningitis	16	9	7	......	15	1	8	1	1	1	......	......	3	1	1	......	......	6	5	5
Tabes dorsalis (locomotor ataxia)	2	1	1	1	1	......	......	......	......	......	......	1	......	......	1	......	......	2	......	......
Other diseases of the spinal cord	2	2	......	1	1	......	......	......	......	......	......	......	2	......	......	......	......	1	1	......
Cerebral hemorrhage	71	43	28	9	58	4	2	......	......	......	4	9	23	16	12	5	......	41	20	10
Cerebral embolism and thrombosis	2	2	......	......	2	......	......	......	......	......	......	......	......	1	1	......	......	1	......	1
Hemiplegia	8	4	4	......	8	......	......	......	......	......	......	......	2	4	2	......	......	4	3	1
Other paralysis without specified cause	2	1	1	1	1	......	......	......	......	......	......	......	......	2	......	......	......	1	1	......
General paralysis of the insane	17	15	2	......	17	......	......	......	......	......	1	6	6	2	1	......	1	11	2	4
Dementia precox	1	......	1	......	1	......	......	......	......	......	1	......	......	......	......	......	......	1	......	......
Manic depressive psychosis	1	......	1	......	1	......	......	......	......	1	......	......	......	......	......	......	......	......	......	1
Epilepsy	5	5	......	......	5	......	......	......	......	1	......	2	......	1	1	......	......	1	2	2
Chorea	1	......	1	......	1	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......
Softening of the brain	8	3	5	......	8	......	......	......	......	......	2	......	2	1	3	......	......	3	2	3
Imbecility	1	1	......	......	1	......	......	......	......	1	......	......	......	......	......	......	......	1	......	......
Tumor of the brain	1	......	1	......	1	......	......	......	......	......	1	......	......	......	......	......	......	1	......	......
Other diseases of the nervous system	1	......	1	......	1	......	......	......	......	1	......	......	......	......	......	......	......	1	......	......
Diseases of the ear	7	4	3	......	6	1	2	1	......	......	2	1	1	......	......	......	......	3	3	1
Diseases of the circulatory system.																				
Pericarditis	1	......	1	......	1	......	......	......	......	......	......	1	......	......	......	......	......	1	......	......
Acute endocarditis	15	9	6	2	13	......	......	1	3	1	5	1	2	......	2	......	......	10	4	1
Acute myocarditis	3	2	1	......	3	......	1	......	......	1	1	......	......	......	......	......	......	......	1	2
Angina pectoris	5	4	1	2	3	......	......	......	......	......	......	1	2	1	1	......	......	2	1	2
Other diseases of the heart	130	76	54	17	111	2	4	1	4	10	5	18	24	23	28	13	......	105	14	11
Aneurysm	12	10	2	1	11	......	......	......	......	......	1	5	5	1	......	......	......	4	5	3
Arteriosclerosis	31	17	14	4	24	3	......	......	......	......	......	1	3	9	10	7	1	23	5	3

Table IV.—DEATHS OF RESIDENTS OF THE CANAL ZONE AND THE CITIES OF PANAMA AND COLON, BY CAUSE, SEX, COLOR, AGE, AND PLACE OF RESIDENCE, 1928.—Contd.

Cause of death.	Total deaths.	Sex.		Color.			Age (in years).											Place of residence.		
		M.	F.	W.	B.	Y.	Under 1 year.	1-4	5-10	11-20	21-30	31-40	41-50	51-60	61-75	76-100	Age unknown	Panama.	Colon.	Canal Zone.
Diseases of the circulatory system.—Continued.																				
Other diseases of the arteries	5	4	1	1	4	.....	.....	.....	.....	.....	1	1	2	1	.....	.....	.....	2	3	.....
Embolism and thrombosis (not cerebral)	4	2	2	1	3	.....	.....	.....	.....	.....	.....	1	1	1	1	.....	.....	3	.....	1
Varices	1	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....
Diseases of the respiratory system.																				
Diseases of the nasal fossae and their annexa	3	2	1	.....	3	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	.....	2	.....	1
Acute bronchitis	18	13	5	2	16	.....	14	2	1	.....	.....	.....	.....	.....	.....	1	.....	16	1	1
Chronic bronchitis	11	8	3	.....	10	1	2	.....	.....	.....	.....	2	1	1	4	1	.....	3	8	.....
Bronchitis, unspecified (under 5 years of age)	7	5	2	1	6	.....	4	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	1	.....
Bronchopneumonia	250	143	107	16	232	2	109	81	3	4	8	10	9	7	12	4	3	189	42	19
Capillary bronchitis	2	.....	2	.....	2	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....
Lobar pneumonia	80	60	20	7	71	2	4	6	1	2	14	26	14	5	6	2	.....	43	24	13
Pneumonia, unspecified	20	11	9	2	17	1	3	1	.....	2	6	3	3	1	1	.....	.....	14	2	4
Pleurisy	1	.....	1	.....	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....
Empyema	4	2	2	.....	4	.....	.....	1	.....	1	.....	.....	1	1	.....	.....	.....	3	1	.....
Congestion of the lungs	4	.....	4	1	3	.....	.....	.....	1	1	.....	.....	1	.....	.....	1	.....	3	1	.....
Edema of the lungs	4	2	2	1	2	1	1	.....	.....	.....	1	.....	1	.....	1	.....	.....	4	.....	.....
Gangrene of the lung	3	3	.....	.....	3	.....	.....	.....	1	1	.....	.....	1	.....	.....	.....	.....	1	1	1
Asthma	4	2	2	1	3	.....	.....	2	.....	1	.....	1	.....	.....	.....	.....	.....	1	3	.....
Other diseases of the respiratory system (tuberculosis excepted)	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....
Diseases of the digestive system.																				
Stomatitis	1	.....	1	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
Other diseases of the mouth and annexa	2	2	.....	1	1	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	1	1	.....
Diseases of the pharynx and tonsils	1	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....
Diseases of the esophagus	1	.....	1	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
Ulcer of the stomach	9	9	.....	1	7	1	.....	.....	.....	.....	.....	5	1	1	2	.....	.....	3	3	3
Ulcer of the duodenum	3	2	1	2	1	.....	.....	.....	.....	.....	.....	1	1	.....	1	.....	.....	.....	.....	3
Acute gastritis	17	9	8	1	16	.....	13	2	.....	.....	.....	.....	.....	.....	2	.....	.....	14	2	1
Chronic gastritis	6	1	5	.....	6	.....	.....	.....	.....	1	.....	3	.....	.....	2	.....	.....	3	3	.....
Other diseases of the stomach (cancer excepted)	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....
Enteritis, colitis, or entero-colitis (under 2 years of age)	130	68	62	19	110	1	108	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	106	16	8
Intestinal autointoxication (under 2 years of age)	4	3	1	1	3	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	2
Enteritis, colitis, or entero-colitis (2 years and over)	21	8	13	3	18	.....	.....	7	2	.....	2	1	1	3	4	1	.....	11	9	1
Ankylostomiasis	6	6	.....	.....	6	.....	.....	2	1	.....	.....	1	2	.....	.....	.....	.....	3	.....	3
Nematodes (other than ankylostoma)	3	1	2	1	2	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....
Parasites not specified	1	1	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
Acute appendicitis	14	10	4	5	9	.....	.....	1	.....	2	3	4	2	1	1	.....	.....	8	3	3

Chronic appendicitis	1	......	1	1	......	......	......	......	......	......	......	1	......	......	......	......	......	1	......	......
Hernia	9	8	1	......	8	1	......	......	......	......	......	1	3	3	2	......	......	7	2	......
Intestinal obstruction	8	5	3	2	5	1	3	......	1	......	......	......	2	......	2	......	......	6	2	......
Other diseases of the intestines	5	2	3	1	4	......	1	......	......	......	......	2	1	......	1	......	......	4	1	......
Acute yellow atrophy of the liver	1	1	......	......	......	1	......	......	......	......	......	......	1	......	......	......	......	1	......	......
Cirrhosis of the liver specified as alcoholic	1	1	......	......	1	......	......	......	......	......	......	......	1	......	......	......	......	......	1	......
Cirrhosis of the liver not specified as alcoholic	8	5	3	1	7	......	......	1	......	......	2	......	1	3	1	......	......	4	3	1
Biliary calculi	4	3	1	2	2	......	......	......	......	......	1	1	......	2	......	......	......	4	......	......
Abcess of the liver (unqualified)	5	5	......	1	4	......	......	......	......	1	2	1	......	1	......	......	......	3	1	1
Cholecystitis	4	2	2	1	2	1	......	......	......	1	1	1	1	......	......	......	......	3	1	......
Other diseases of the liver	2	2	......	......	2	......	1	......	......	......	......	......	......	1	......	......	......	2	......	......
Peritonitis without specified cause (except puerperal)	12	9	3	......	12	......	......	......	1	3	2	2	3	1	......	......	......	8	4	......
Nonvenereal diseases of the genito-urinary system and annexa.																				
Acute nephritis (including unspecified under 10 years of age)	17	10	7	2	12	3	6	7	1	1	......	1	1	......	......	......	......	13	3	1
Chronic nephritis (including unspecified 10 years and over)	140	68	72	13	126	1	......	......	1	1	11	33	23	25	31	14	1	102	20	18
Pyonephritis	2	2	......	......	1	1	......	......	......	......	......	......	1	......	1	......	......	2	......	......
Pyelonephrosis	3	2	1	......	3	......	......	1	......	......	1	......	......	1	......	......	......	1	......	2
Pyelitis	4	2	2	......	4	......	3	......	......	......	......	1	......	......	......	......	......	3	1	......
Hydronephrosis	1	1	......	......	1	......	......	......	1	......	......	......	......	......	......	......	......	......	......	1
Diseases of the bladder	3	2	1	1	2	......	1	......	......	......	......	......	......	1	1	......	......	3	......	......
Stricture of the urethra	1	1	......	1	......	......	......	......	......	......	......	......	......	1	......	......	......	......	......	1
Chronic prostatitis	1	1	......	......	1	......	......	......	......	......	......	1	......	......	......	......	......	1	......	......
Abscess of the prostate	1	1	......	......	1	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......
Hypertrophy of the prostate	1	1	......	......	1	......	......	......	......	......	......	......	......	1	......	......	......	1	......	......
Salpingitis and pelvic abscess (female). (Not gonococcic)	3	......	3	......	3	......	......	......	......	1	1	......	......	......	1	......	......	1	1	1
The puerperal state.																				
Abortion (miscarriage, premature birth, etc.)	2	......	2	1	......	1	......	......	......	......	2	......	......	......	......	......	......	1	......	1
Ectopic gestation	3	......	3	1	2	......	......	......	......	......	3	......	......	......	......	......	......	......	2	1
Other accidents of pregnancy	2	......	2	......	2	......	......	......	......	1	......	1	......	......	......	......	......	1	......	1
Puerperal hemorrhage	3	......	3	......	2	1	......	......	......	......	2	1	......	......	......	......	......	2	1	......
Cesarean section	1	......	1	......	1	......	......	......	......	......	......	1	......	......	......	......	......	......	......	1
Puerperal septicemia	4	......	4	1	3	......	......	......	......	1	2	1	......	......	......	......	......	4	......	......
Puerperal albuminuria and convulsions	9	......	9	1	8	......	......	......	......	4	3	1	1	......	......	......	......	3	4	2
Diseases of the skin and of the cellular tissue.																				
Gangrene	5	2	3	......	5	......	......	......	......	1	......	1	......	2	......	1	......	5	......	......
Acute abscess	10	8	2	1	9	......	1	1	......	6	......	1	......	1	......	......	......	5	4	1
Pemphigus contagiosus	1	......	1	......	1	......	1	......	......	......	......	......	......	......	......	......	......	1	......	......
Elephantiasis (non-filarial)	2	1	1	1	1	......	......	......	......	......	......	......	......	1	......	1	......	1	1	......
Diseases of the bones and of the organs of locomotion.																				
Osteomyelitis	6	3	3	......	6	......	1	2	1	1	......	......	......	1	......	......	......	4	1	1

TABLE IV.—DEATHS OF RESIDENTS OF THE CANAL ZONE AND THE CITIES OF PANAMA AND COLON, BY CAUSE, SEX, COLOR, AGE, AND PLACE OF RESIDENCE, 1928.—Contd.

Cause of death.	Total deaths.	Sex.		Color.			Age (in years).											Place of residence.		
		M.	F.	W.	B.	Y.	Under 1 year.	1–4	5–10	11–20	21–30	31–40	41–50	51–60	61–75	76–100	Age unknown	Panama.	Colon.	Canal Zone.
Malformations.																				
Congenital hydrocephalus	6	2	4	2	4		6											4		2
Congenital malformations of the heart	4	4		2	2		4											2	1	1
Other congenital malformations (stillbirths not included)	6	2	4	1	5		5		1									5	1	
Early infancy.																				
Congenital debility	36	18	18	1	34	1	36											25	9	2
Icterus of the newborn	2	1	1		2		2											1	1	
Malnutrition	20	10	10	1	19		20											9	7	4
Premature birth	44	31	13	7	35	2	44											24	9	11
Injury at birth	14	10	4	1	13		14											8	3	3
Other diseases peculiar to early infancy	32	20	12	3	29		32											26	4	2
Old age.																				
Senility	14	3	11	4	10										5	9		8	2	4
External causes.																				
Suicide by solid or liquid poisons (corrosive substances excepted)	3	2	1	3							1	1			1				1	2
Suicide by corrosive substances	1		1		1					1								1		
Suicide by hanging or strangulation	2	2		1		1				1		1						2		
Suicide by firearms	6	6		4	2						4	1	1					3		3
Suicide by cutting or piercing instruments	2	2		2							1	1						1		1
Suicide by jumping from high places	1	1		1							1									1
Other suicides	1	1				1								1				1		
Acute accidental poisonings (gas excepted)	4	4		2	2			1	1				2						1	3
Accidental burns (conflagration excepted)	6	4	2	2	3	1	1	2					2	1				3	1	2
Accidental mechanical suffocation	1		1	1			1											1		
Accidental absorption of irrespirable, irritating or poisonous gas	2	1	1		2					1			1					1		1
Accidental drowning	19	17	2	3	15	1		2		5	3	4	5					5	3	11
Accidental traumatism by firearms (wounds of war excepted)	1	1			1					1										1
Accidental traumatism by fall	15	12	3	5	10			1		1	5	2	2			2	2	6	3	6
Railroad accident	4	4		3	1					1	1	1			1				1	3
Automobile accident	15	13	2	3	12			2	2	4	3	2	2					11	1	3
Injuries by other vehicles	2	2		1	1							2							1	1

Injuries by animals (not poisoning)	2	2	......	1	1	......	......	......	......	......	1	......	1	......	......	......	......	......	......	2
Accidental electric shocks	1	1	......	......	......	1	......	......	......	1	......	......	......	......	......	......	......	......	1	......
Homicide by firearms	5	4	1	4	1	......	......	......	......	2	2	1	......	......	......	......	......	2	......	3
Homicide by cutting or piercing instruments	5	4	1	1	4	......	......	......	......	......	2	1	1	1	......	......	......	3	2	......
Homicide by other means	2	1	1	......	2	......	......	......	......	......	1	1	......	......	......	......	......	1	1	......
Other external violence	3	2	1	1	2	......	......	......	......	2	......	......	1	......	......	......	......	3	......	......
Ill-defined diseases.																				
Ill-defined	5	2	3	2	3	......	......	2	1	......	1	1	......	......	......	......	......	3	......	2
Not specified or unknown	10	5	5	......	10	......	2	3	1	......	......	1	1	......	2	......	......	4	1	5
Infection of undetermined origin	4	3	1	1	3	......	2	2	......	......	......	......	......	......	......	......	......	......	......	4
Surgical operation and shock	1	1	......	......	1	......	......	......	1	......	......	......	......	......	......	......	......	1	......	......
Totals	2,192	1,269	923	276	1,865	51	505	206	47	144	225	296	286	207	195	69	12	1,434	442	316

Table V.—DEATHS OF NONRESIDENTS, BY CAUSE, SEX, COLOR, AND AGE, 1928.

Cause of death.	Total deaths.	Sex.		Color.			Age (in years).										
		M.	F.	W.	B.	Y.	Less than 1 year.	1–4	5–10	11–20	21–30	31–40	41–50	51–60	61–75	76–90	Un-known
Typhoid fever	4	3	1	2	2					1	2	1					
Malaria, estivoautumnal	3	2	1		2	1		1			1	1					
Malaria, tertian	1	1			1			1									
Malaria, type undetermined	5	3	2		5			2	1	2							
Malaria, clinical	2	1	1		2		1	1									
Dysentery, amebic	4	3	1		4					1	1			1	1		
Leprosy	2	1	1		2							1		1			
Meningococcus meningitis	1	1		1							1						
Tetanus	1		1		1		1										
Tuberculosis of the respiratory system	32	23	9	3	29					4	7	11	8	1	1		
Tuberculosis of the meninges and central nervous system	1	1			1						1						
Tuberculosis of the genito-urinary system	1		1	1						1							
Syphilis	9	8	1	1	7	1							7		1	1	
Pyemia	1	1			1						1						
Septicemia	1	1			1								1				
Cancer and other malignant tumors of the buccal cavity	1	1		1									1				
Cancer and other malignant tumors of the stomach and liver	2	2		1	1								1	1			
Cancer and other malignant tumors of the peritoneum, intestines, and rectum	1		1		1								1				
Cancer and other malignant tumors of the female genital organs	2		2	2								1		1			
Cancer and other malignant tumors of other or unspecified organs	2	2			2									1	1		
Pellagra	1	1			1							1					
Beriberi	1	1			1					1							
Diseases of the thymus gland	1	1		1						1							
Leukemia	2	1	1	2									2				
Simple meningitis	3	3		1	1	1					1	2					
Cerebral hemorrhage	3	2	1	2	1								1	1	1		
Hemiplegia	1	1		1											1		
General paralysis of the insane	6	5	1		6						2	2	2				
Dementia precox	1		1		1							1					
Toxic psychosis	1		1		1									1			
Organic diseases of the heart	14	14		4	10					1	1	3	3	2	3	1	
Aneurysm	1	1		1										1			
Arteriosclerosis	1	1			1										1		
Other diseases of the arteries	1		1		1										1		
Diseases of the nasal fossae	1	1				1					1						
Chronic bronchitis	2	2			2							1		1			
Bronchopneumonia	18	12	6	3	14	1	1	2		3		4	3	2	2	1	
Lobar pneumonia	16	14	2	3	12	1				1	6	3	3	2			1
Pneumonia, unspecified	6	6		1	5						2	3		1			
Ulcer of duodenum	1	1		1										1			
Intestinal autointoxication	1		1		1		1										
Gastrectasis	1		1		1						1						
Enteritis, colitis, or entero-colitis (under 2 years of age)	5	2	3		5		4	1									

Enteritis, colitis, or entero-colitis (2 years and over)	1	1			1									1			
Ankylostomiasis	3	2	1		3		1					1		1			
Appendicitis, acute and chronic	4	3	1	2	2					1	1	1	1				
Hernia	4	2	2	1	3							1	1		2		
Intestinal obstruction	2	1	1	1	1							1				1	
Cirrhosis of the liver, not specified as alcoholic	5	4	1	3	2								1	3	1		
Biliary calculi	2	2		2								1	1				
Abscess of the liver	2	2			2						1	1					
Cholecystitis	1	1		1											1		
Other diseases of the liver	1		1	1											1		
Peritonitis without specified cause (except puerperal)	1	1			1						1						
Acute nephritis (including unspecified under 10 years of age)	1	1			1							1					
Chronic nephritis (including unspecified 10 years and over)	11	8	3	1	9	1					1	1	2	2	3	2	
Pyelonephrosis	1		1		1							1					
Hypertrophy of the prostate	2	2		1	1							1				1	
Salpingitis and pelvic abscess (female). (Not gonococcic)	2		2		2						2						
Acute abscess	2	2		2							1		1				
Congenital malformations (stillbirths not included)	1	1			1		1										
Congenital debility (-1 year only)	1		1		1		1										
Suicide by hanging	2	1	1	1		1					2						
Accidental burns (conflagration excepted)	1	1				1				1							
Accidental drowning	6	5	1	5	1					1	2	1	1	1			
Accidental traumatism by firearms (wounds of war excepted)	1	1			1						1						
Accidental traumatism by fall	2	2			1	1							2				
Accidental traumatism by machines	2	2		2									2				
Accidental traumatism by crushing, landslide	1	1			1						1						
Ill-defined	2	1	1	1	1								2				
Not specified or unknown	2	2		1	1							2					
Totals	230	172	58	57	163	10	11	8	1	19	41	48	47	26	21	7	1

TABLE VI.—STATISTICS REGARDING AMERICAN EMPLOYEES AND THEIR FAMILIES, 1928.

	Annual death rate per 1,000.
White employees from the United States:	
Disease	4.13
External causes	.69
Total	4.82
Families of white employees from the United States:	
Disease	4.88
External causes	....
Total	4.88
White employees from the United States and their families:	
Disease	4.61
External causes	.25
Total	4.86

Number of American children born on the Isthmus during the year	160
Deaths among American children under 1 year of age	14
Infant mortality rate among American children (number of deaths per 1,000 live births)	87.50

TABLE VII.—BIRTHS AND BIRTH RATES IN THE CANAL ZONE AND THE CITIES OF PANAMA AND COLON, 1928.

Place.	Population.	Births.			Rate per 1,000 population.		
		Total.	Alive.	Stillborn.	Total.	Alive.	Stillborn.
Year 1928:							
Panama	59,818	2,578	2,458	120	43.10	41.09	2.01
Colon	32,000	801	760	41	25.03	23.75	1.28
Canal Zone	37,056	550	513	37	14.84	13.84	1.00
Total	128,874	3,929	3,731	198	30.49	28.95	1.54
Year 1927:							
Panama	59,636	2,509	2,389	120	42.07	40.06	2.01
Colon	31,583	795	737	58	25.17	23.34	1.84
Canal Zone	36,794	579	547	32	15.74	14.87	.87
Total	128,012	3,883	3,673	210	30.33	28.69	1.64

TABLE VIII.—INFANT MORTALITY RATES IN THE CANAL ZONE AND THE CITIES OF PANAMA AND COLON.

Place.	Live births.			Deaths among children under 1 year of age.	
	Male.	Female.	Total.	Number.	Rate per 1,000 live births.
Year 1928:					
Panama	1,268	1,190	2,458	364	148.09
Colon	415	345	760	79	103.95
Canal Zone	260	253	513	59	115.01
Totals	1,943	1,788	3,731	502	134.55
Year 1927:					
Panama	1,235	1,154	2,389	287	120.13
Colon	369	368	737	80	108.54
Canal Zone	294	253	547	59	107.86
Totals	1,898	1,775	3,673	426	115.98

TABLE IX.—DISCHARGES AND DEATHS IN HOSPITALS OF THE PANAMA CANAL, 1928.

Disease.	Total discharges.	Total deaths.	Employees.		Nonemployees.			Nonresidents.	
			White.	Black.	White.		Black.	White.	Black.
					Military.	Others			
Epidemic, endemic, and infectious diseases.									
Typhoid fever	11	4	......	......	......	2	7	6	......
Paratyphoid fever	......	1	......	......	......	......	1	......	......
Typhoid or paratyphoid bacillus carrier	1	......	......	......	......	......	1	......	......
Clinical typhoid fever	1	......	......	......	......	1	......	......	......
Relapsing fever (Spirillum obermeieri)	4	......	......	1	......	1	......	2	......
Malta fever	1	......	......	......	......	......	......	1	......
Malaria, estivoautumnal	581	6	33	112	93	51	275	19	4
Malaria, tertian	264	......	27	28	61	53	84	9	2
Malaria, quartan	6	......	......	......	2	......	4	......	......
Malaria, mixed	7	......	......	1	......	1	5	......	......
Malaria, type undetermined	1	......	......	......	1	......	......	......	......
Malaria, clinical	5	......	1	1	......	1	1	1	......
Smallpox, variola	1	......	......	......	......	......	......	......	1
Measles	45	......	2	1	14	15	12	1	......
Scarlet fever	1	......	......	......	......	1	......	......	......
Whooping cough	3	1	......	......	......	1	3	......	......
Diphtheria	44	2	......	......	......	16	30	......	......
Diphtheria bacillus carrier	3	......	......	......	......	1	2	......	......
Influenza with pulmonary complications specified	32	......	6	4	2	12	8	......	......
Influenza without pulmonary complications specified	446	1	73	57	168	86	48	13	2
Mumps	83	......	5	20	36	9	13	......	......
Dysentery, amebic	23	2	1	3	9	2	7	3	......
Dysentery, bacillary	7	1	......	1	2	2	3	......	......
Dysentery, unclassified	3	......	......	......	......	......	......	3	......
Erysipelas	26	1	5	3	3	13	2	1	......
Acute anterior poliomyelitis	5	......	......	......	......	3	2	......	......
Meningococcus meningitis	3	5	......	......	4	2	1	1	......
Chicken pox	21	......	1	5	1	8	6	......	......
German measles	1	......	......	......	......	1	......	......	......
Other epidemic and endemic diseases	3	......	......	1	......	2	......	......	......
Tetanus	1	......	......	......	......	......	1	......	......
Thrush	1	......	......	......	......	......	1	......	......
Tuberculosis of the respiratory system	71	43	11	19	18	16	42	8	......
Tuberculosis of the meninges and central nervous system	2	2	......	......	......	......	4	......	......
Tuberculosis of the intestines and peritoneum	5	2	......	......	1	1	5	......	......
Tuberculosis of the vertebral column	5	1	......	......	......	2	3	1	......
Tuberculosis of the joints	3	......	......	......	......	......	3	......	......
Tuberculosis of the skin and subcutaneous tissue	3	......	......	......	......	1	2	......	......
Tuberculosis of the lymphatic system (mesenteric and retroperitoneal glands excepted)	4	......	......	......	......	2	2	......	......
Tuberculosis of the genito-urinary system	2	......	1	......	1	......	......	......	......
Tuberculosis of other organs than the above	2	......	......	......	......	......	2	......	......
Acute disseminated tuberculosis	......	1	......	......	......	......	1	......	......
Primary syphilis	6	......	1	......	2	......	1	2	......
Secondary syphilis	12	......	......	6	2	......	3	1	......
Tertiary syphilis	103	18	2	52	5	10	46	5	1
Cerebrospinal syphilis	17	2	1	4	3	3	6	2	......
Hereditary syphilis	1	2	......	......	......	......	3	......	......
Other forms of syphilis	15	......	......	4	3	......	7	1	......
Soft chancre	76	......	2	21	21	4	7	19	2
Chancroidal lymphadenitis	6	......	1	1	1	......	......	3	......
Gonococcic urethritis	270	......	4	87	77	14	26	59	3
Gonococcic orchitis and epididymitis	1	......	......	......	1	......	......	......	......
Gonococcic arthritis	6	......	......	......	......	......	6	......	......
Gonococcic ophthalmia	8	......	......	2	1	......	5	......	......
Gonococcic vaginitis	16	......	......	1	......	1	14	......	......
Gonococcic salpingitis	4	......	......	......	......	......	4	......	......
Other gonococcus infection	5	......	......	......	3	1	1	......	......
Pyemia and septicemia	2	1	......	......	......	1	1	1	......
Pyemia	2	......	......	......	......	1	1	......	......
Septicemia	3	3	......	1	1	......	3	1	......
Filariasis	2	......	......	......	......	......	......	2	......
General diseases not included in Class I.									
Cancer and other malignant tumors of the buccal cavity	6	......	2	1	......	1	......	2	......
Cancer and other malignant tumors of the stomach and liver	12	9	......	4	......	5	10	2	......

TABLE IX.—DISCHARGES AND DEATHS IN HOSPITALS OF THE PANAMA CANAL, 1928.—Continued.

Disease.	Total discharges.	Total deaths.	Employees.		Nonemployees.			Nonresidents.	
			White.	Black.	White.		Black.	White.	Black.
					Military.	Others			
General diseases.—Continued.									
Cancer and other malignant tumors of the peritoneum, intestines, and rectum	3	3	5	...	....	1	......	....	.....
Cancer and other malignant tumors of the female genital organs	29	5	.....	......	.....	11	21	2	......
Cancer and other malignant tumors of the breast	7	1	1	......	.....	1	6	.....	......
Cancer and other malignant tumors of the skin	3	......	......	......	......	2	......	1	......
Cancer and other malignant tumors of other or unspecified organs	23	8	4	2	2	9	11	3	.....
Benign tumors and tumors not returned as malignant. (Tumors of the female genital organs excepted.)	65	1	7	11	17	13	18	..	......
Acute rheumatic fever	12	2	......	3	......	1	9	1	......
Chronic rheumatism, osteoarthritis, gout	12	......	1	......	1	9	1	...	......
Scurvy	1	......	......	.....	......	1	......	.....	.....
Pellagra	1	4	......	......	......	......	5	......	......
Beriberi	......	3	......	......	......	......	3	......	......
Rickets	2	......	......	......	......	1	1	......	......
Diabetes mellitus	45	3	9	4	2	13	14	6	......
Pernicious anemia	6	......	......	......	....	3	......	3	......
Other anemias and chlorosis	7	......	1	......	......	3	3	......	......
Diseases of the pituitary gland	2	......	......	......	......	2	......	......	......
Exophthalmic goiter	2	......	......	......	1	......	1	......	......
Other diseases of the thyroid gland	34	......	5	......	6	11	6	6	......
Diseases of the thymus gland	1	......	......	......	......	1	......	......	......
Diseases of the spleen	3	1	......	1	1	......	2	......	......
Leukemia	5	4	2	1	......	3	......	3	......
Hodgkin's disease	2	1	......	......	......	1	1	1	......
Acute alcoholism	30	......	5	2	10	7	2	4	......
Chronic alcoholism	16	......	......	......	11	4	......	1	......
Alcoholic psychosis	2	......	......	......	2	......	......	......	......
Other alcoholic poisoning	1	......	......	1	......	......	......	......	......
Chronic lead poisoning	8	......	......	6	1	......	......	1	......
Other chronic poisoning by mineral substances under this title	2	......	......	1	......	......	1	......	......
Drug habit	3	......	......	......	......	1	......	2	......
Other forms of chronic organic poisoning	1	......	......	......	......	1	......	......	......
Other general diseases	79	4	1	......	4	48	28	2	......
Diseases of the nervous system and of the organs of special sense.									
Encephalitis	2	2	1	......	......	1	2	......	......
Simple meningitis	......	5	......	1	......	......	4	......	......
Nonepidemic cerebrospinal meningitis	......	1	......	......	......	1	......	......	......
Tabes dorsalis (locomotor ataxia)	3	1	......	......	......	......	2	1	1
Other diseases of the spinal cord	1	1	......	1	1	......	......	......	......
Cerebral hemorrhage	6	21	2	9	......	4	11	1	......
Cerebral embolism and thrombosis	1	2	......	1	......	1	1	......	......
Hemiplegia	4	1	......	3	......	......	2	......	......
Other paralysis without specified cause under this title	4	......	......	......	2	......	1	1	....
General paralysis of the insane	17	23	1	11	3	2	21	2	....
Dementia precox	109	2	......	4	52	10	34	10	1
Manic depressive psychosis	27	1	......	......	10	4	11	3	......
Toxic psychosis	9	......	1	1	2	1	4	......	......
Hypochondriasis	4	......	.....	1	1	1	......	1	.....
Other forms of mental alienation	45	......	2	......	23	6	10	4	......
Epilepsy	21	2	1	3	4	7	6	2	......
Infantile convulsions (under 5 years of age)	7	......	......	.....	......	2	4	1	......
Chorea	1	......	......	......	.....	......	1	......	......
Neuritis	29	......	3	4	8	6	6	2	......
Hysteria	43	......	3	3	15	7	14	1	......
Other neuralgias and neuritis	18	......	1	7	3	3	3	1	......
Softening of the brain	......	6	......	1	......	......	5	......	......
Imbecility	3	1	......	......	2	......	2	......	......
Tumor of the brain	1	......	......	......	......	......	1	......	......
Neurasthenia	60	......	9	......	23	21	1	6	......
Other diseases of the nervous system	36	......	.....	2	17	10	5	2	....
Follicular conjunctivitis	15	......	......	3	6	1	3	2	....
Trachoma	5	......	1	......	2	2	......	......	....
Disease of cornea	57	......	6	16	7	5	21	1	1

Table IX.—DISCHARGES AND DEATHS IN HOSPITALS OF THE PANAMA CANAL, 1928.—Continued.

Disease.	Total discharges.	Total deaths.	Employees.		Nonemployees.			Non-residents.	
			White.	Black.	White.		Black.	White.	Black.
					Military.	Others			
Diseases of the nervous system.—Continued.									
Disease of iris	50	......	2	18	17	1	12	......	......
Disease of lens	39	......	3	7	1	10	14	4	......
Disease of fundus	27	......	4	3	5	2	11	2	......
Other diseases of the eye and annexa	176	......	3	37	47	20	54	14	1
Diseases of the ear	185	3	8	14	97	25	38	6	......
Diseases of the mastoid process	17	......	......	5	3	4	4	1	......
Diseases of the circulatory system.									
Acute endocarditis	4	3	......	1	1	......	4	1	......
Acute myocarditis	......	2	......	......	......	......	2	......	......
Angina pectoris	......	1	......	......	......	1	......	......	......
Other diseases of the heart	95	13	10	24	9	23	36	6	......
Aneurysm	1	2	......	2	......	1	......	......	......
Arteriosclerosis	87	7	11	40	2	15	19	6	1
Other diseases of the arteries	15	......	2	......	3	7	1	2	......
Embolism and thrombosis (not cerebral)	......	2	1	......	......	......	1	......	......
Hemorrhoids	144	......	14	22	65	17	21	5	......
Varices	16	......	2	1	7	4	1	1	......
Varicocele	7	......	1	......	5	......	......	1	......
Phlebitis	9	......	......	2	4	2	1	......	......
Thrombosis	1	......	......	......	......	......	1	......	......
Other diseases of the veins	1	......	......	......	......	1	......	......	......
Lymphangitis	15	......	1	5	5	1	......	3	......
Lymphadenitis, nonvenereal	138	......	6	15	51	9	45	12	......
Other diseases of the lymphatic system	5	......	......	1	1	1	2	......	......
Hemorrhage without specified cause. (Noncerebral)	8	......	1	1	1	5	......	......	......
Other diseases of the circulatory system	59	1	5	13	2	4	34	2	......
Diseases of the respiratory system.									
Disease of the nasal fossae	125	1	20	9	54	16	16	11	......
Other diseases of the nasal fossae and their annexa	58	2	13	7	20	6	9	5	......
Diseases of the larynx	6	......	2	......	......	3	1	......	......
Acute bronchitis	227	1	21	22	49	57	70	8	1
Chronic bronchitis	57	......	7	7	21	11	6	4	1
Bronchitis unspecified (under 5 years of age)	8	......	......	......	......	5	3	......	......
Bronchitis unspecified (5 years and over)	6	......	......	......	......	2	4	......	......
Bronchopneumonia	54	27	2	6	1	10	54	7	1
Capillary bronchitis	1	......	......	......	......	......	1	......	......
Lobar pneumonia	63	30	3	25	8	10	44	2	1
Pleurisy	56	......	1	10	23	8	11	2	1
Empyema	1	1	......	......	......	......	1	1	......
Pneumothorax	......	1	......	......	......	......	1	......	......
Other diseases of the pleura	1	......	......	1	......	......	......	......	......
Gangrene of the lung	......	1	......	......	......	......	1	......	......
Asthma	47	1	3	6	10	9	16	4	......
Other diseases of the respiratory system (tuberculosis excepted)	4	1	......	2	1	1	1	......	......
Diseases of the digestive system.									
Diseases of the teeth and gums	84	......	12	9	27	14	15	7	......
Stomatitis	14	......	4	1	......	8	1	......	......
Other diseases of the mouth and annexa	13	1	3	1	6	2	2	......	......
Adenoid vegetations	5	......	......	......	......	2	3	......	......
Other diseases of the pharynx and tonsils	1,220	......	65	56	287	336	416	59	1
Diseases of the esophagus	3	......	......	1	......	......	1	1	......
Ulcer of the stomach	18	8	2	11	2	3	5	3	......
Ulcer of the duodenum	75	3	17	24	13	8	5	11	......
Gastrectasis	3	......	......	1	......	1	1	......	......
Acute gastritis	54	......	7	14	15	4	12	2	......
Chronic gastritis	40	......	3	15	9	......	5	8	......
Acute indigestion	11	......	......	2	......	4	5	......	......
Other diseases of the stomach (cancer excepted)	118	......	17	10	16	35	28	12	......
Enteritis, colitis, or entero-colitis (under 2 years of age)	23	11	......	......	......	12	15	7	......
Intestinal autointoxication (under 2 years of age.)	7	......	......	......	......	3	3	1	......
Enteritis, colitis, or entero-colitis (2 years and over.)	107	2	13	23	16	31	13	13	......

TABLE IX.—DISCHARGES AND DEATHS IN HOSPITALS OF THE PANAMA CANAL, 1928.—Continued.

Disease.	Total discharges.	Total deaths.	Employees.		Nonemployees.			Non-residents.	
					White.				
			White.	Black.	Military.	Others	Black.	White.	Black.
Diseases of the digestive system.—Continued.									
Intestinal autointoxication (2 years and over)	68	......	5	11	24	11	15	2	......
Ankylostomiasis	79	1	1	26	7	3	39	4	......
Cestodes (hydatids of the liver excepted)	3	......	1	......	......	......	......	2	......
Trematodes	1	......	......	......	......	......	......	1	......
Nematodes (other than ankylostoma)	16	......	......	1	1	2	9	3	......
Other parasites, specified	3	......	......	......	......	......	2	1	......
Acute appendicitis	136	5	10	8	64	22	19	18	......
Chronic appendicitis	86	1	13	5	26	26	7	10	......
Hernia	162	4	12	55	37	13	26	20	3
Intestinal obstruction	9	......	1	1	3	1	2	1	......
Other diseases of the intestines	248	3	34	21	64	52	43	37	......
Acute yellow atrophy of the liver	......	1	......	......	......	1	......	......	......
Cirrhosis of the liver not specified as alcoholic	10	3	1	1	......	2	4	5	......
Biliary calculi	23	1	5	1	......	13	1	4	......
Abscess of the liver (unqualified)	2	1	......	......	1	1	......	1	......
Cholecystitis	59	......	12	4	9	15	6	13	......
Other diseases of the liver	38	1	2	4	22	4	4	3	......
Diseases of the pancreas	2	......	......	......	......	2	......	......	......
Peritonitis without specified cause (except puerperal)	5	2	......	......	1	1	3	2	......
Other diseases of the digestive system (cancer and tuberculosis excepted)	1	......	......	......	1	......	......	......	......
Nonvenereal diseases of the genito-urinary system and annexa.									
Acute nephritis (including unspecified under 10 years of age)	14	4	......	......	1	4	13	......	......
Chronic nephritis (including unspecified 10 years and over)	45	27	6	20	2	9	29	5	1
Pyonephritis	2	......	1	......	......	......	......	1	......
Pyelonephrosis	1	2	......	......	1	......	2	......	......
Pyelitis	104	1	12	5	11	28	46	3	......
Perinephritic abscess	1	......	1	......	......	......	......	......	......
Hydronephrosis	......	1	......	......	......	......	1	......	......
Movable kidney	4	......	......	1	1	1	1	......	......
Other diseases of the kidneys and annexa (puerperal nephritis excepted)	18	......	2	2	7	5	1	1	......
Calculi of the urinary passages	39	......	8	......	15	12	1	3	......
Diseases of the bladder	52	......	4	11	12	12	9	4	......
Stricture of the urethra	35	1	6	20	4	2	1	2	1
Diseases of the urethra, urinary abscess, etc	11	......	......	5	......	2	2	1	1
Acute prostatitis	6	......	1	......	3	1	......	1	......
Chronic prostatitis	14	2	2	5	3	......	1	5	......
Hypertrophy of the prostate	12	......	4	6	......	......	1	1	......
Hydrocele	32	......	2	9	9	5	5	2	......
Other nonveneral diseases of the male genital organs	58	......	2	17	20	6	7	6	......
Cysts and other benign tumors of the ovary	19	......	1	......	......	5	12	1	......
Salpingitis and pelvic abscess (female). (Not gonococcic)	124	3	1	1	......	13	109	3	......
Benign tumors of the uterus	72	......	3	2	......	9	56	2	......
Nonpuerperal uterine hemorrhage	10	......	2	......	......	5	2	1	......
Leukorrhea	1	......	......	......	......	......	1	......	......
Dysmenorrhea	21	......	2	......	......	10	9	......	......
Cervicitis	38	......	......	......	......	14	20	4	......
Endometritis	33	......	1	......	......	11	14	7	......
Stenosis of cervix	1	......	......	......	......	......	1	......	......
Prolapsus uteri	7	......	......	......	......	2	5	......	......
Lacerations, old or recent of cervix and perineum	36	......	......	......	......	21	14	1	......
Benign tumors of the female genital organs (except of uterus)	6	......	......	......	......	2	3	1	......
Other diseases of the female genital organs	114	......	1	2	......	24	85	2	......
Non-puerperal diseases of the breast (cancer excepted)	20	......	......	......	......	5	15	......	......
The puerperal state.									
Abortion (miscarriage, premature birth, etc)	124	2	3	......	......	44	77	2	......
Ectopic gestation	5	1	......	......	......	3	3	......	......
Other accidents of pregnancy	38	2	......	......	......	7	33	......	......

TABLE IX.—DISCHARGES AND DEATHS IN HOSPITALS OF THE PANAMA CANAL, 1928.—Continued.

Disease.	Total discharges.	Total deaths.	Employees.		Nonemployees.			Nonresidents.	
			White.	Black.	White.		Black.	White.	Black.
					Military.	Others			
The puerperal state.—Continued.									
Puerperal hemorrhage	3	1	......	......	......	1	3	......	......
Cesarean section	2	1	......	......	......	......	3	......	......
Other surgical operations and intrumental delivery	15	......	......	......	......	8	7	......	......
Other accidents of labor	13	......	......	......	......	3	10	......	......
Puerperal septicemia	5	1	......	......	......	......	6	......	......
Puerperal albuminuria and convulsions	23	4	......	......	......	8	19	......	......
Following childbirth (not otherwise defined)	7	......	......	......	......	1	6	......	......
Puerperal diseases of the breast	13	......	......	......	......	6	7	......	......
Diseases of the skin and of the cellular tissue.									
Gangrene	5	1	......	2	1	......	3	......	......
Furuncle	43	......	3	13	8	10	3	6	......
Acute abscess	239	8	22	34	41	49	76	23	2
Trichophytosis	55	......	5	1	19	16	7	7	......
Scabies	17	......	3	......	1	2	8	2	1
Pemphigus contagiosus	2	......	......	......	1	......	1	......	......
Myiasis of the skin	3	......	......	1	2	......	......	......	......
Dhobie itch	2	......	1	......	......	1	......	......	......
Ulcer of the skin	29	......	......	12	1	3	10	3	......
Tropical ulcer	1	......	......	......	1	......	......	......	......
Impetigo contagiosa	2	......	......	......	1	......	1	......	......
Impetigo simplex	4	......	......	......	......	1	2	1	......
Urticaria	14	......	1	1	5	4	2	1	......
Eczema	7	......	1	1	2	1	1	1	......
Ingrowing nail	21	......	2	......	5	9	5	......	......
Other diseases of skin and annexa	70	......	6	9	28	15	8	4	......
Diseases of the bones and of the organs of locomotion.									
Osteomyelitis	19	4	1	1	3	3	14	1	......
Periostitis	4	......	1	1	......	1	1	......	......
Other diseases of the bones (tuberculosis excepted) (Sinusitis also excepted)	5	......	......	2	2	......	1	......	......
Ankylosis	1	......	......	......	......	......	1	......	......
Arthritis	89	......	7	19	20	18	13	12	......
Synovitis	20	......	2	2	12	2	2	......	......
Other diseases of the joints (tuberculosis and rheumatism excepted)	11	......	4	......	4	2	1	......	......
Amputations	12	......	1	3	5	1	2	......	......
Other diseases of the organs of locomotion	83	......	8	14	42	8	9	2	......
Malformations.									
Congenital hydrocephalus	1	4	......	......	......	3	2	......	......
Congenital malformations of the heart	......	1	......	......	......	......	1	......	......
Other congenital malformations (stillbirths not included)	87	3	1	9	15	15	49	1	......
Early infancy.									
Congenital debility	1	4	......	......	......	......	5	......	......
Malnutrition	3	7	......	......	......	1	9	......	......
Premature birth	4	15	......	......	......	6	13	......	......
Injury at birth	......	5	......	......	......	1	4	......	......
Other diseases peculiar to early infancy	2	3	......	......	......	......	5	......	......
Infantile beriberi	1	......	......	......	......	1	......	......	......
Lack of care	......	1	......	......	......	......	1	......	......
Old age.									
Senility	7	3	3	......	......	5	2	......	......
Senile dementia	6	1	......	1	......	1	5	......	......
External causes.									
Suicide by solid or liquid poisons (corrosive substances excepted.)	......	1	1	......	......	......	......	......	......
Attempted suicide by firearms	1	......	......	......	......	1	......	......	......
Suicide by cutting or piercing instruments	......	1	......	......	......	1	......	......	......
Poisoning by food	63	......	9	1	45	6	2	......	......
Poisoning by venomous animals	8	......	......	1	3	1	3	......	......

Table IX.—DISCHARGES AND DEATHS IN HOSPITALS OF THE PANAMA CANAL, 1928.—Continued.

Disease.	Total discharges.	Total deaths.	Employees.		Nonemployees.			Nonresidents.	
			White.	Black.	White		Black.	White.	Black.
					Military.	Others			
External causes.—Continued.									
Other acute accidental poisonings (gas excepted)	22	2	2	1	8	9	3	1	.....
Accidental burns (conflagration excepted)	32	2	1	3	3	6	11	8	2
Accidental mechanical suffocation	1	.....	.....	1	.....	.....	.....	.....	.....
Accidental absorption of irrespirable, irritating or poisonous gas	12	2	1	4	1	.....	5	3	.....
Accidental traumatism by firearms (wounds of war excepted)	27	1	3	2	15	1	6	1	.....
Accidental traumatism by cutting or piercing instruments	73	.....	4	37	7	5	18	2	.....
Accidental traumatism by fall	251	3	25	37	46	30	80	33	3
Accidental traumatism in mines	1	.....	.....	1	.....	.....	.....	.....	.....
Accidental traumatism in quarries	1	.....	.....	1	.....	.....	.....	.....	.....
Accidental traumatism by machines	28	1	4	12	2	.....	6	5	.....
Railroad accidents	9	.....	.....	6	1	1	1	.....	.....
Automobile accidents	57	2	5	10	17	10	16	1	.....
Airplane and balloon accidents	6	.....	.....	.....	6	.....	.....	.....	.....
Motorcycle accidents	6	.....	2	1	2	1	.....	.....	.....
Injuries by other vehicles	12	.....	2	9	.....	.....	.....	1	.....
Landslide, other crushing	54	.....	1	32	6	3	8	4	.....
Injuries by animals (not poisoning)	12	1	1	1	6	.....	5	.....	.....
Gunshot wounds	7	.....	.....	.....	6	.....	.....	1	.....
Other wounds of war	1	.....	.....	.....	.....	1	.....	.....	.....
Excessive heat	4	.....	.....	.....	3	.....	.....	1	.....
Homicide and attempted homicide by firearms	2	1	.....	.....	1	1	1	.....	.....
Homicide and attempted homicide by cutting or piercing instruments	14	1	.....	6	.....	.....	6	3	.....
Homicide and attempted homicide by other means.	9	.....	1	3	.....	.....	2	3	.....
Fracture	71	5	4	7	34	12	14	5	.....
Dislocation	4	.....	.....	.....	.....	2	1	1	.....
Sprain	26	.....	.....	10	7	2	2	5	.....
Other external violence	255	2	12	56	85	21	55	26	2
Ill-defined diseases.									
Cause of death not specified or ill-defined	2	.....	.....	.....	.....	.....	1	.....	1
Ill-defined	61	1	6	7	15	19	7	8	.....
Not specified or unknown	2	3	.....	.....	.....	1	2	2	.....
Infection of undetermined origin	14	2	.....	2	3	5	4	2	.....
Feigned disease	2	.....	.....	.....	1	.....	.....	1	.....
Normal physiological conditions.									
Normal pregnancy	91	.....	.....	.....	.....	27	60	4	.....
Normal labor	708	.....	.....	.....	.....	207	496	5	.....
Newborn child	716	.....	.....	.....	.....	211	502	3	.....
No disease (companion, observation, etc.)	471	.....	14	9	69	218	85	55	1
Totals	13,002	509	872	1,648	2,639	2,782	4,612	914	44

Table X.—CONSOLIDATED HOSPITAL AND OCLONY REPORT.

Classification of patients.	Remaining January 1, 1928.			Admitted.			Died.			Discharged.			Transferred.			Remaining Dec. 31, 1928.		
	White American	White foreign.	Black.	White American	White foreign.	Black.	White American	White foreign	Black.	White American	White foreign.	Black.	White American	White foreign.	Black.	White American	White foreign.	Black.
Gorgas Hospital:																		
Employees	17	4	58	683	113	1,486	13	4	66	650	107	1,353	1		27	36	6	98
Army and Navy	113			2,257			8			2,228			44			90		
Panaman Government.			1		1	15			2			2		1	11			1
Charity	13	6	43	157	90	806	11		45	148	89	756	1	1	19	10	6	29
All others	42	33	93	1,518	1,293	2,670	24	30	138	1,493	1,240	2,515	8	12	28	35	44	85
Totals	185	43	195	4,615	1,497	4,977	56	34	251	4,519	1,436	4,626	54	14	85	171	56	213
Corozal Hospital:																		
Employees	1	1	20	1		13	1		6	1		10	2				1	17
Army and Navy	5			81						81				1	8	3		
Panaman Government.		96	300		21	90		5	40		15	40					96	302
Charity	1	8	42		1	18			8	1	1	8			1		8	43
All others		13	57	8	19	23			11	6	13	14				2	19	55
Totals	7	118	419	90	41	144	1	5	65	89	29	72	2	1	9	5	124	417
Cripples		4	26		1	5						2			4		5	25
Chronic medical and surgical cases		4	34		1	35		1	5		1	10			11		3	43
Colon Hospital:																		
Employees			8	112	11	267	1		19	95	8	185	15	3	64	1		7
Army and Navy	11			412			3			324			90			6		
Charity		1	11	54	15	325	4		15	49	13	297		1	15	1	2	9
All others	2	15	18	401	236	887	8	7	34	340	187	735	43	51	118	12	6	18
Totals	13	16	37	979	262	1,479	16	7	68	808	208	1,217	148	55	197	20	8	34
Palo Seco Leper Colony:																		
Panaman Government.		6	72			7		1	4			2					5	73
Charity			25			2			2									25
Totals		6	97			9		1	6			2					5	98
Totals by classes:																		
Employees	18	5	86	796	124	1,766	15	4	91	746	115	1,548	16	3	91	37	7	122
Army and Navy	129			2,750			11			2,633			136			99		
Panaman Government.		102	373		22	112		6	46		15	44		2	19		101	376
Charity, cripples and chronics	14	22	178	211	108	1,191	15		75	198	104	1,073	1	2	51	11	24	170
All others	44	62	171	1,927	1,548	3,580	32	38	183	1,839	1,440	3,264	51	63	147	49	69	157
Grand totals	205	191	808	5,684	1,802	6,649	73	48	395	5,416	1,674	5,929	204	70	308	196	201	825

TABLE XI.—NUMBER OF DAYS HOSPITAL TREATMENT FURNISHED, AND AVERAGE NUMBER IN HOSPITAL EACH DAY, OF THE VARIOUS CLASSES OF PATIENTS, 1928.

Class of patients.	Number of days treatment.				Average number in hospital each day.			
	American.	Foreign.	Black.	Total.	American.	Foreign.	Black.	Total.
Gorgas Hospital:								
Employees	9,683	2,280	31,834	43,797	26.45	6.23	86.98	119.66
Army and Navy	42,492	....	....	42,492	116.10	....	....	116.10
Panaman Government	....	3	399	402	....	.01	1.09	1.10
Charity	3,073	2,415	13,768	19,256	8.40	6.60	37.61	52.61
All others	15,213	20,056	43,729	78,998	41.57	54.80	119.48	215.84
Totals	70,461	24,754	89,730	184,945	192.52	67.63	245.16	505.31
Corozal Hospital:								
Employees	98	366	6,386	6,850	.27	1.00	17.45	18.72
Army and Navy	2,340	....	....	2,340	6.39	....	....	6.39
Panaman Government	62	37,571	107,471	145,104	.17	102.65	293.64	396.46
Charity	209	2,950	15,502	18,661	.57	8.06	42.35	50.98
All others	436	6,139	21,205	27,780	1.19	16.77	57.94	75.90
Total	3,145	47,026	150,564	200,735	8.59	128.48	411.38	548.45
Cripples	....	1,463	9,643	11,106	....	4.00	26.35	30.35
Chronic medical and surgical cases	....	1,283	13,070	14,353	....	3.50	35.71	39.21
Colon Hospital:								
Employees	686	71	1,924	2,681	1.87	.19	5.26	7.32
Army and Navy	3,650	....	....	3,650	9.97	....	....	9.97
Charity	478	143	2,923	3,544	1.31	.39	7.99	9.69
All others	2,310	2,392	6,765	11,467	6.31	6.54	18.48	31.33
Totals	7,124	2,606	11,612	21,342	19.46	7.12	31.73	58.31
Palo Seco Leper Colony:								
Panaman Government	....	1,978	26,775	28,753	....	5.40	73.16	78.56
Canal Zone Government	....	....	9,248	9,248	....	....	25.27	25.27
Totals	....	1,978	36,023	38,001	....	5.40	98.43	103.83
Totals by classes:								
Employees	10,467	2,717	40,144	53,328	28.60	7.42	109.68	145.70
Army and Navy	48,482	....	....	48,482	132.46	....	....	132.46
Panaman Government	62	39,552	134,645	174,259	.17	108.07	367.88	476.12
Canal Government, charity, cripples and chronics	3,760	8,254	64,154	76,168	10.27	22.55	175.29	208.11
All others	17,959	28,587	71,699	118,245	49.07	78.11	195.90	323.08
Grand totals	80,730	79,110	310,642	470,482	220.57	216.15	848.75	1,285.47

TABLE XII.—REPORT OF DISPENSARIES, 1928.

EMPLOYEES TREATED IN QUARTERS.

Dispensary.	Remaining January 1, 1928.		Admitted.		Died.		Discharged.		Transferred.		Remaining December 31, 1928.	
	White.	Black.	White.	Black.	White.	Black.	White.	Black.	White.	Black.	White	Black.
Ancon	......	7	960	1,025	......	......	914	965	46	59	......	8
Balboa	......	1	1,183	803	......	......	1,180	801	......	......	3	3
Pedro Miguel	......	1	251	5	......	......	246	6	4	......	1	......
Gatun	......	3	133	216	......	......	129	205	4	13	......	1
Colon	2	21	587	929	......	2	586	934	......	......	3	14
Totals	2	33	3,114	2,978	......	2	3,055	2,911	54	72	7	26

Dispensary furnishing treatment.	Days treatment furnished.			Average number treated in quarters per day.		
	White.	Black.	Total.	White.	Black.	Total.
Ancon	2,143	4,630	6,773	5.85	12.65	18.50
Balboa	2,568	1,926	4,494	7.02	5.26	12.28
Pedro Miguel	860	50	910	2.35	.14	2.49
Gatun	263	765	1,028	.72	2.09	2.81
Colon	1,970	8,004	9,974	5.38	21.87	27.25
Totals	7,804	15,375	23,179	21.32	42.01	63.33

ALL CASES TREATED.

Dispensary.	Employees.			Nonemployees.			Total.		
	White.	Black.	Total.	White.	Black.	Total.	White	Black.	Total.
Ancon	6,397	16,627	23,024	4,615	17,482	22,097	11,012	34,109	45,121
Balboa	14,994	17,122	32,116	12,081	9,881	21,962	27,075	27,003	54,078
Pedro Miguel	3,579	7,192	10,771	8,198	18,411	26,609	11,777	25,603	37,380
Gatun	3,573	7,579	11,152	4,579	7,204	11,783	8,152	14,783	22,935
Colon	4,573	19,826	24,399	5,427	16,866	22,293	10,000	36,692	46,692
Totals	33,116	68,346	101,462	34,900	69,844	104,744	68,016	138,190	206,206

TABLE XIII.—CONSOLIDATED REPORT OF ADMISSION, HOSPITALS AND DISPENSARIES, 1928.

All classes of patients.	White.	Black.	Total.
Admissions to hospitals, excluding Corozal farm (cripples and chronic ward)	7,484	6,609	14,093
Admission of employees to quarters	3,114	2,978	6,092
Total admissions to hospitals and quarters	10,598	9,587	20,185
Less number of patients transferred between hospitals and from quarters to hospitals, whose admissions are duplicated in above figures	328	364	692
Net admissions to hospitals and quarters	10,270	9,223	19,493
Employees only.			
Employees admitted to hospitals	920	1,766	2,686
Employees admitted to quarters	3,114	2,978	6,092
Total admissions of employees	4,034	4,744	8,778
Less number transferred between hospitals and from quarters to hospitals, whose admissions are duplicated in the above figures	73	163	236
Net admission of employees	3,961	4,581	8,542

AVERAGE NUMBER OF DAYS IN HOSPITALS AND QUARTERS FOR EACH ADMISSION, EMPLOYEES ONLY.

	White.	Black.	Total.
Hospitals:			
Gorgas	15.59	25.50	22.06
Colon	6.15	7.21	6.87
Average for hospitals	14.33	22.73	19.85
Quarters:			
Ancon	2.23	4.51	3.41
Balboa	2.17	2.40	2.26
Pedro Miguel	3.42	10.00	3.55
Gatun	1.98	3.54	2.95
Colon	3.36	8.62	6.58
Average for quarters	2.51	5.16	3.80

TABLE XIV.—COROZAL HOSPITAL COMMITMENTS AND DISCHARGES, 1928.

COMMITMENTS.

Insane patients only.	From Canal Zone.		From Panama.		Total.
	Male.	Female.	Male.	Female.	
First admission	121	33	56	32	242
Second admission	8	1	5	8	22
Third admission	1	....	3	3	7
Fourth admission	....	....	1	....	1
Fifth admission	....	....	1	....	1
Seventh admission	....	1	....	....	1
Eighth admission	....	1	....	....	1
Totals	130	36	66	43	275

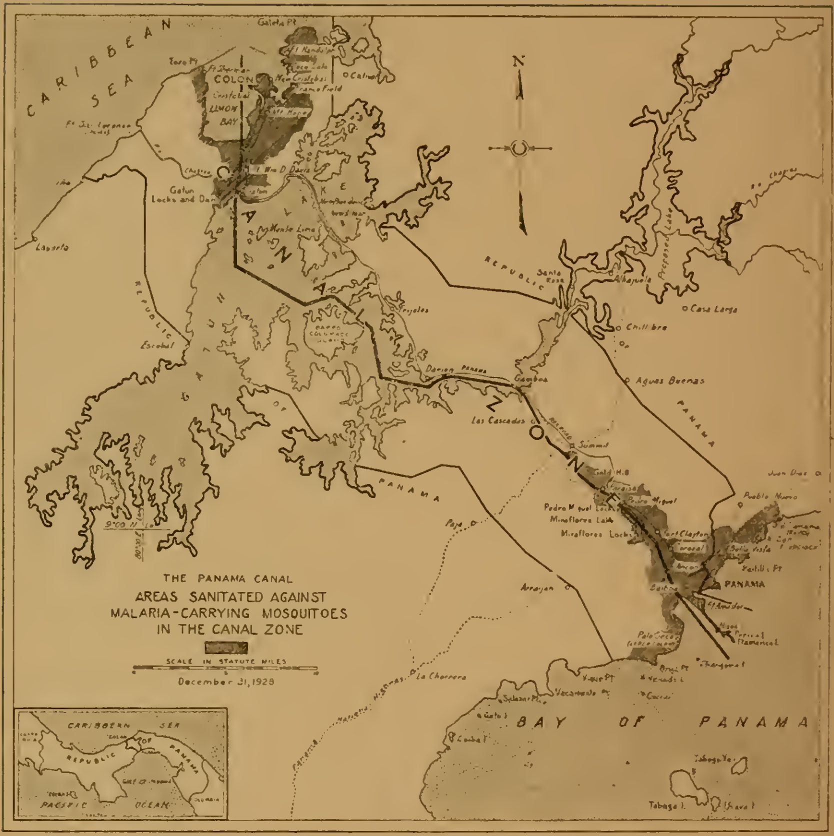
DISCHARGES.

Insane patients only.	Male.	Female.	Total.
Well	11	2	13
Improved	81	33	114
Unimproved	54	20	74
Totals	146	55	201

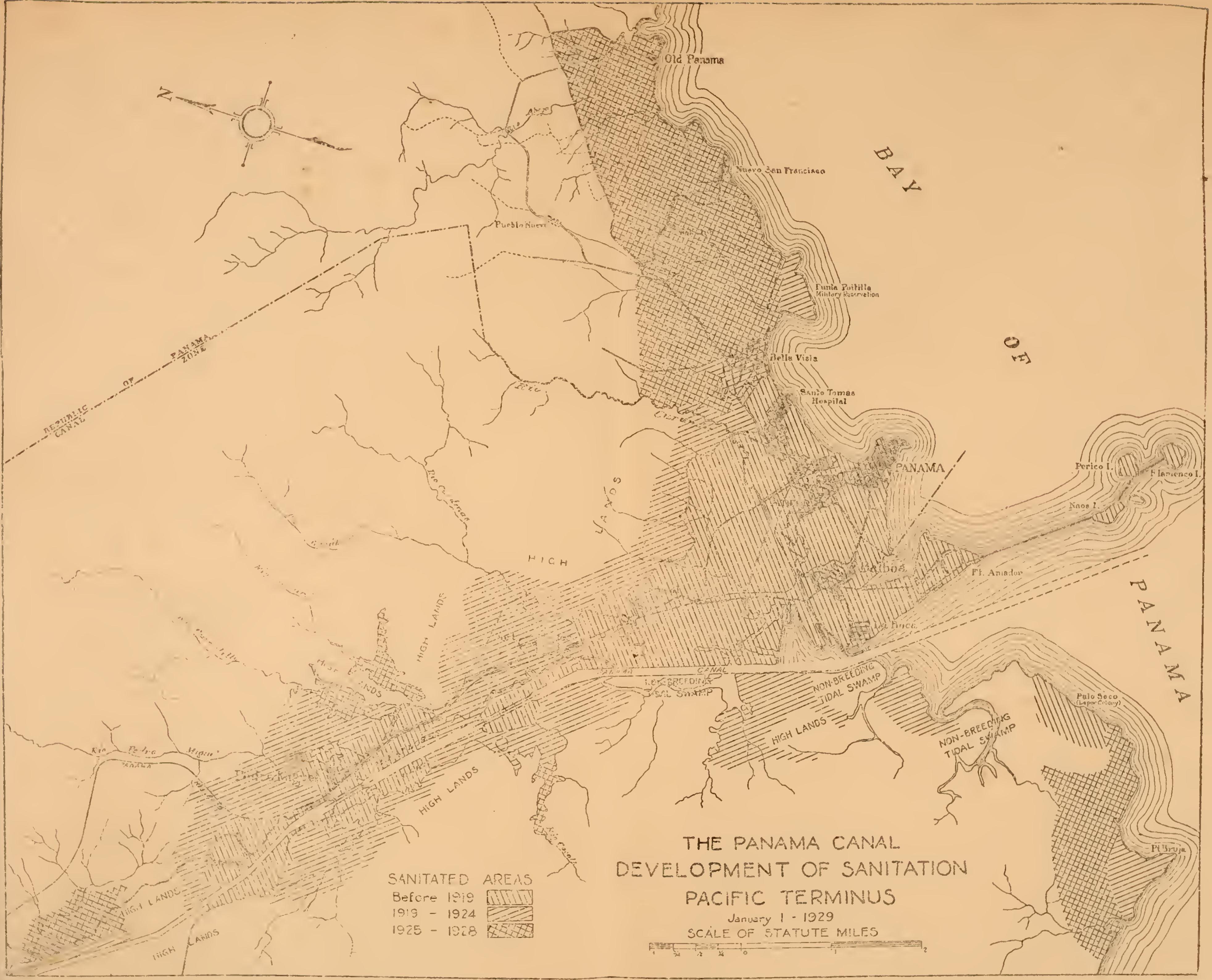
TABLE XV.—FORCE REPORT OF HEALTH DEPARTMENT.

	December, 31, 1928.			1927.	1926.
	Gold.	Silver.	Total.		
Chief Health Office	5	0	5	6	5
Quarantine Service	12	25	37	35	33
Health Office, Panama	10	125	135	136	130
Health Office, Colon	8	85	93	98	77
Gorgas Hospital	166	259	425	411	359
Colon Hospital	24	38	62	61	59
Palo Seco Leper Colony	1	37	38	38	38
Zone Sanitation	5	124	129	147	157
Corozal Hospital	21	126	147	136	122
Line Dispensaries	14	9	23	21	20
Totals	266	828	1,094	1,089	1,000

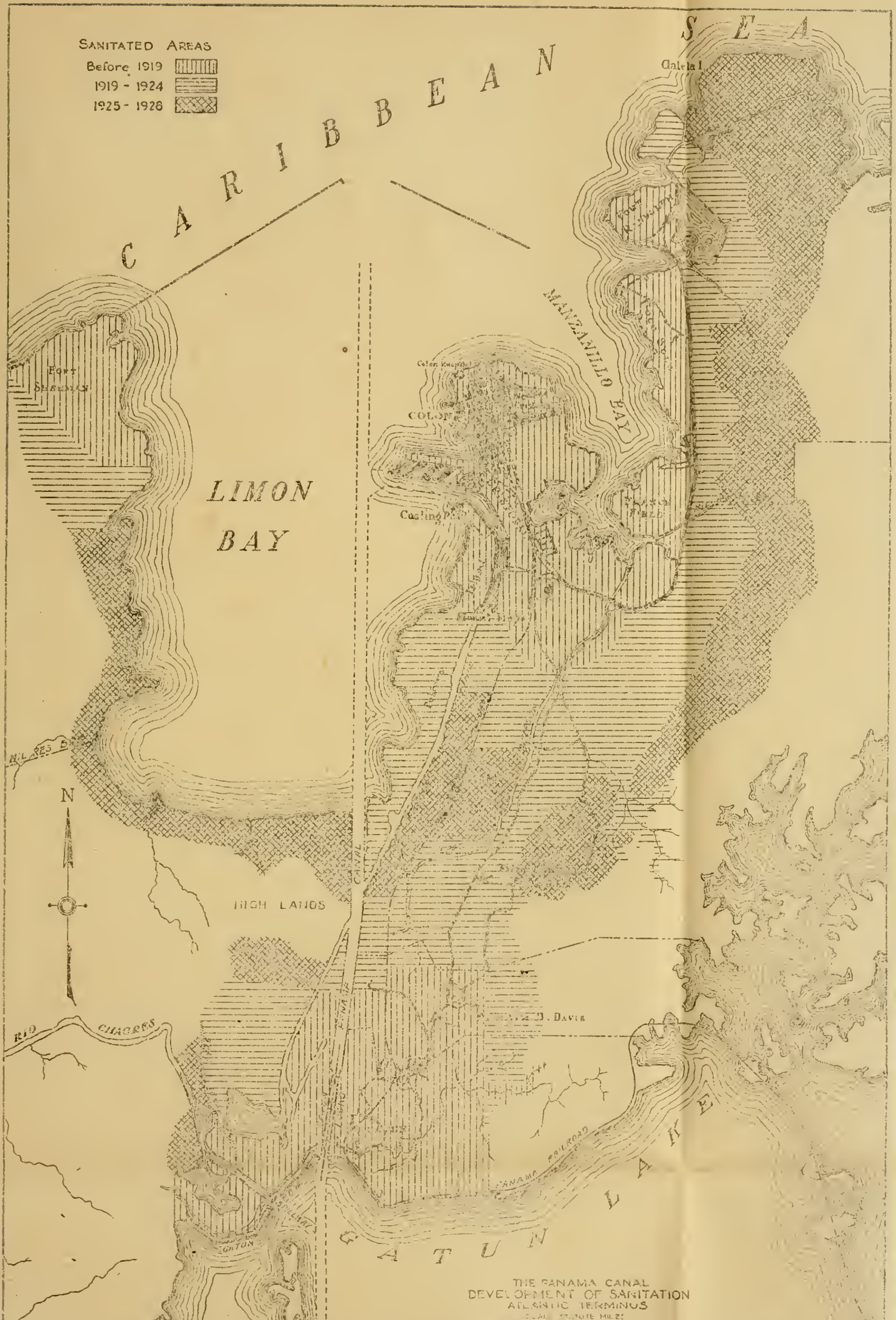
MR 15902—Panama Canal—2-6-30—1,000



Map No. 1.—Sanitated Areas in the Canal Zone.—The channel of the Canal is represented by the heavy black line from Cristobal and Limon Bay on the Caribbean side to Balboa and Panama Bay on the Pacific side. The two lighter lines, at a distance of five miles on either side of the Canal, are the boundaries between the Canal Zone and the Republic of Panama. The Canal Zone also includes all of Gatun Lake, together with a narrow border of land around it, and the basin of the proposed lake in the upper Chagres River basin. The total areas sanitated against malaria are shown in heavy shading about the two terminals of the Canal; the same areas are shown in greater detail in Maps 2 and 3. Within these sanitated areas are concentrated the bulk of the Canal employees, as well as the military forces and their families. Elsewhere in the Canal Zone practically all employees and their families are furnished thoroughly screened quarters, but no antimosquito work is carried out. Farmers, known as "Zone settlers," live outside the sanitated areas and are unprotected against malaria.



Map No. 2.—The development of antimalaria sanitation at the Pacific end of the Canal Zone. Note the extensive recent work carried out for the protection of Panama City. The recent work at Point Bruja was done by the Army to protect military reservations.



MAP No. 3.—The development of antimalaria sanitation at the Atlantic end of the Canal Zone. Of the areas sanitated recently (1925-1928) about one-fourth was drained by the Army and three-fourths by the Health Department of The Panama Canal.

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